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IN PERSIA AND AFGHANISTAN WITH THE CITROËN TRANS-ASIATIC EXPEDITION: *A paper read at the Evening Meeting of the Society on 20 November 1933, by*

JOSEPH HACKIN

TO begin with, I wish on behalf of the Citroën-Haardt Expedition to express our sincere thanks for the most valuable help which the Royal Geographical Society so generously gave to the expedition. When in 1930 the plans of the expedition were suddenly changed, and it was decided to go through Afghanistan and northern India, the Society supplied the late Mr. Haardt with many maps and furnished him with important information which otherwise would have taken many months to obtain. I feel therefore all the more honoured to speak before this distinguished audience, and I hope that the little information I am able to give on the geography and the ethnography of Afghanistan may be of some interest to the Society.

The original project as conceived and worked out by G. M. Haardt included an itinerary from Beirut to Peking without any break in the use of mechanical transport; but circumstances to which I have alluded and into the details of which I shall not now enter compelled the leader of the expedition to allow for a detour by southern Afghanistan, north-western India, and the Kashmir Hunza. This route presented in the region of the Pamirs such obstacles as were bound to break the mechanical continuity. For the original plan comprising a single group of cars leaving Beirut for Peking, a different organization had to be substituted: the expedition was divided into two groups, one starting from Beirut, the other from Peking, making towards each other and endeavouring to reduce as far as possible the break in continuity imposed by the unusually difficult nature of the ground. I joined the first group, Beirut–Pamir, which was to leave its cars on the other side of Gilgit to proceed northwards on horseback. The meeting of the two groups took place at Aqsu, in Chinese Turkistan.

The material collected by the Citroën-Haardt Expedition in Afghanistan shows the interest and the diversity of the ethnic elements which make up the population of the country. As these ethnic features have a rich historic background, the expedition had the opportunity of observing many ancient monuments on its route: Pre-Islamic monuments which call to mind the

AFGHANISTAN
Hazarajat
Taimeni
Firuzkohi
Kataghan
Badakhshan
Kohistan
Kabul
Kandahar
Herat
Mazar-i-Sharif
Khanabad
Charikar
Jalalabad
Peshawar
Ghazni
Mukur
Farah
Sabzawar
Chakansur
Girishk
Qala-i-Bist
Qala-i-Nao
Daolat Yar
Maimana
Haibak
Ghuri
Andkhui
Akcha
Shibirgan
Sar-i-Pul
Murghab
Bala Murghab
Band-i-Jackar
Marichak
Lamen
Zarmast P.
Islam Kala
Hari Rud
Harut Rud
Farah Rud
Khash Rud
Helmand
Arghandab
Kokaran
Kilmand
Tirnak
Quetta
Khyber Pass
Jamrud
Indus
Kabul R.
Oxus
Kunduz R.
Surkhab
Shibar P.
Shahr-i-Zohak
Hajigak P.
Unai P.
Dandan Shikan P.
Ak Robat P.
Qara Kotal
Koh-i-Baba
Bamiyan
Route
Miles
Kilometres
60° S O V I E T T U R K I S T A N
I N D I A
72° N
68° E
64° E
38° N
32° N

remarkable fusion of Hellenism, Buddhism, and Iranian Mazdeism; Islamic monuments which bear witness to the astounding rise and splendour of the Ghaznavids' capital; and, at Herat, the remains of the glory of the Timurid age. Moreover the expedition could also note the influence of human races, different in origin and formation, on the country itself.

Entering Afghanistan by Herat, the expedition of G. M. Haardt and L. Auduoin-Dubreuil proceeded to Kabul by the southern road which passes almost entirely through purely "Afghan" country, through Farah, Girishk, Kandahar, and Ghazni. A northern itinerary, which the expedition had originally planned to take, was partially reconnoitered by M. de Vassoigne, who went from Herat to Maimana. Moreover I have recently had the opportunity of passing along the new route Kabul–Mazar-i-Sharif–Balkh–Shibirgan–Andkhui–Maimana–Herat. In this way the expedition as a whole has collected data on several itineraries which form a large circuit in Afghanistan.

The expedition is greatly indebted to the Government of His late Majesty Nadir Shah for facilitating the task of its artist, cameramen, photographers, archaeologist, and other specialists who were enabled to collect documents and materials for future study. Thanks to the efficient and thorough help of the Afghan Government and to that of the local authorities who acted on instructions from H.R.H. the Prime Minister, the expedition did not lose a single day, and was given the opportunity of studying certain ethnic elements relatively distant from its route.

I regret to say that I can only give you in this lecture an incomplete and fragmentary account of the value of the material collected, as the limited time does not permit me to dwell on details.

All travellers who have stayed at Herat have noted its great importance and the richness of its soil. Until recently however, owing to the poor condition of the tracks which connected it, it has been isolated from other parts of Afghanistan. This quasi-isolation, which greatly hampered the trade of the province, will end with the completion of two new roads. One, a mountain road passing through the Hazarajat, will bring Kabul within three days' travel of Herat. It has already been constructed as far as Daolat Yar. The other, 450 miles long, connects Herat with Mazar-i-Sharif, the capital of Afghan Turkistan. This road serves such important economic centres as Andkhui and Maimana, and connects the north-eastern part of the Chahar Aimak country (Taimeni, Hazarah, Firuzkohi, Jemshedi) with Herat. Although certain sections of this track will have to be further improved, the journey from Mazar-i-Sharif can, at the present time, be made in less than four days.

The monuments of Herat, especially those of the Timurid epoch, have been greatly damaged. The Mosque (Musallah) and the School (Madressa), two monuments of the fifteenth century, have been described by Colonel Yate, who saw them in 1885, shortly before they were destroyed. Their place is still marked by the minarets which were spared and which preserve in certain places delicately and beautifully designed *kashi* (tile work). With a telephoto lens we secured several good photographs of the principal motives of decoration on these minarets. I should also like to mention the so-called Shah Rukh Tomb, which is in point of fact not only the tomb of Shah Rukh, great-grandson

of Tamerlane, but also of Baisangor, grandson of Tamerlane. At Gazarga, which is a great pilgrimage centre, is the much-venerated tomb of Abu Ismail Khwaja Ansari, who died in A.D. 1088; there also is the mausoleum of Dost Muhammad Khan, the Great Amir of Afghanistan, who, after a victorious campaign, died in Herat in A.D. 1863.

Beyond Sabzawar we come to the country where pure Afghan is spoken and where the population belongs to the Durrani group. The first tribe that we meet there is the Nurzei. After the collapse of Nadir Shah's Empire in the eighteenth century, the Durrani tribes, under the inspiring leadership of Ahmed Shah, assumed supremacy over all the other tribes of Afghanistan.

Farah, the first important town after Sabzawar, occupied a small portion of the area of the former Prophtasia. It is one of the markets situated on the border of the rich province known in antiquity by the name of Sakasthana. Wars and invasions have, in great part, transformed the present-day Sistan into desert. The region of Chakansur, which has been one of the important centres of ancient Sakasthana, has however been partially reclaimed, and eventually cultivation will be possible in the entire area after the construction of irrigation canals branching off from the Khash Rud and the Helmand River, in the Nasirabad region. This work is being carried on by the Sariks Turkoman, newcomers to the country. Those Turkoman belong to the same tribe that has reclaimed and cultivated the ancient marshes of the Murghab, between Bala Murghab and Maruchak, in north-western Afghanistan.

At Girishk the expedition was fortunate in finding several representatives of the Durrani group, members of the tribes of the Barakzei, Muhhammadzei, Popelzei, and Alizei of Zamindawar, one of the most important tribes of the region. Before the arrival of the expedition at Girishk I had, with Commander Pecqueur, the opportunity of making a trip to Kala-i-Bist, where we saw some advanced elements of the Achekzei tribe. Kala-i-Bist, one of the favoured residences of Mahmud of Ghazni, is beautifully situated at the confluence of the Helmand and the Argandab rivers. Its citadels suffered greatly when besieged by Nadir Shah in the eighteenth century. The only monument of the Ghaznavid period still remaining at Kala-i-Bist is an arch of burnt brick, decorated with motives of sober elegance.

In the Doab country, between the Helmand and the Argandab, the few rare villages are inhabited by the Nurzei, the Atchekzei, and the Alizei. The Argandab may be considered the extreme limit of the territory populated by the tribes of the Durrani group. Having crossed the Argandab we came to the land of the Ghilzai. Near the ford of the Argandab, at Kokkaran, stands the tomb of the great hero of the Ghilzai epic, whom European historians call Mir Weis (Mir Faez) and his compatriots Hadj Mir Khan.

H.E. the Minister of the Interior of Afghanistan, Muhammad Goul Khan, who was at Kandahar, greatly facilitated our task by summoning there men of both the Durrani and the Ghilzai groups, and by organizing several singing and dancing festivals. The Durrani group was represented by men of the Popelzei tribe, and the Ghilzai by the Taraki. Although the fundamental theme of their dances is the same, the nuances vary. The movements of the Popelzei are, I should say, more elegant and more languid than the rude movements of the Taraki, who dance to a much faster rhythm.

Phot. M. O. Williams

The Bamiyan valley

Entering Afghanistan at Islam Kala *Phot. M. O. Williams*

Thanks to the Governor of Ghazni, two other ethnic groups were summoned to Mukur. The first was represented by the Alikhel and the second by the Karotee tribesmen. The dances and the songs registered at Mukur by the expedition on sound films are typically Afghan. Here we were in the heart of the Ghilzai country, and no one but the Andar, who live in the vicinity of Ghazni, could give a better idea of the fierce beauty of the Afghan dances. Beyond Mukur, the Ghilzai come into contact with the Hazarah, mountaineers of Mongol origin, descendants of the military colonies brought there at the beginning of the thirteenth century by the great conqueror Genghiz Khan. The long-haired Hazarah Jaguri have retained a particularly pure Mongol type and their relations with the Ghilzai Suleimankhel were not always especially cordial.

Ghazni, the ancient capital of Mahmud, is in great part the fief of the Andar, who may be considered as some of the best representatives of the Ghilzai type. The Andar, the Suleimankhel of Zurmatt, and the Wardak come frequently to the bazaar of Ghazni, which is the great market for *pustins*, sheepskin coats decorated with delicate embroideries. In the city of Mahmud, ruthlessly sacked by the Ghoride Sultans, there only remain a few monuments, but they are all important specimens of the Muslim art of the eleventh and twelfth centuries. The towers of Victory erected by Mahmud and his great-grandson Ma'asud the Third, the tomb of the father of Mahmud Subuktegin, the tomb of Mahmud itself in the village of Rauza, the Mosque of the Sultan Abd-ur-Rezak, which is a remarkable example of a fortified mosque, all magnificently illustrate the Ghaznavid art which was so pitilessly dealt with by Ghoride invaders. It is possible to say without hesitation that Ghazni is to Islam what Bamiyan is to Buddhism. From the top of the citadel of Ghazni one sees an immense area of ruins; the town of Mahmud, then two towers preserved by their massiveness from the Ghoride's fury, and, at the foot of the hills among luxuriant vegetation, the tomb of the Great Conqueror.

On the way from Ghazni to Kabul the road leads through a part of the territory of the Wardak. The Wardak belong to the Ghilzai group, but they are better policed and more amiable than the others. Their dances have not the crudeness of the Karotee and the Alikhel dances which we saw at Mukur. Their movements are a triumph of suppleness and grace.

During our stay at Kabul we attended several receptions and were granted a Royal audience. Then the expedition went on to Bamiyan. We reached this famous archaeological site by a road which traverses a part of ancient Kapiça (the Kohdaman and the Kohistan of to-day), an ancient lacustrine basin of remarkable fertility. The road then followed the torrential course of the Ghorband, and reached the divide between the Oxus and the Indus basins at the Shibar pass in a region populated by the Hazarah. It joined the ancient road from Kabul to Bamiyan by the passes of Unai and Hadjigak near the ruins of the Shahr-i-Zohak citadel destroyed by Genghiz Khan in A.D. 1222. The word *Bamiyan*, an Iranian name, is the normal Persian derivative of the word *Bamikan*, which is used in the pehlvi *Bundahes* (J. Marquart, P. Pelliot). Until the time of the Mongol conquest (A.D. 1222) Bamiyan might have been one of the most important centres of Middle Asia. Situated about halfway between Balkh (Bactra of the Greeks) and Peshawar (ancient Purushapura) on one of

Entering Afghanistan at Islam Kala Phot. M. O. Williams

the great international trade-routes, its valley was a natural halting-place for caravans. After the hardships endured in crossing the high passes of the Hindu Kush, caravan leaders and merchants could regain their strength there before continuing the difficult journey. The importance of Bamiyan must have been further increased during the Buddhist epoch when the Balkh–Peshawar route represented, as Mr. A. Foucher said, "a link between the Indian and the Scythian halves of the Empire of the great conqueror Kushana Kanishka" (first century A.D.).

At that time the city of Balkh, which had become an international trading centre, was situated at the cross-roads of the three most important highways of Asia: one leading west, towards the Roman Empire; one leading north-east, towards China; and one leading south-east, towards India. It was also at that time that the barbarian Emperor, miraculously converted to Buddhism, used his power and wealth to satisfy his ardent religious zeal. A peculiarity of the local topography was responsible for the fortune of Bamiyan, for "in the middle part of the valley the northern cliffs of tertiary conglomerates offered to the pick and chisel of artisans high vertical surfaces which were used to advantage by the patrons and their architects" (Foucher).

During the second and third centuries A.D., Buddhist institutions multiplied with great rapidity at Bamiyan owing to the impetus given by the patronage of such rulers as Kanishka and his successors. The advent of the Sassanian dynasty in the third century and the extension of its conquest towards the east did not seem to impede the development of the sanctuaries and monasteries at Bamiyan. The rulers of the valley, successors of the great Kushanas, fell under the influence of their powerful neighbours, and between the fourth and the seventh centuries Bamiyan became a centre of Iranian art, or, to be more exact, of Irano-Buddhist art. Bamiyan apparently did not suffer greatly from the brief occupation of the Ephtalites in the fifth century. Pilgrims from far-distant China continued to wend their way towards India, passing through Bamiyan; the most famous of them, Hsuang Tsang, whom Sir Aurel Stein calls his "Patron Saint," saw the sanctuaries of the celebrated valley in A.D. 632. Less than thirty years after the visit of this famous pilgrim the Arabs made their first appearance in the valley, but the sanctuaries remained intact. A Korean monk, Huei Chao, who had passed there at the beginning of the eighth century, found them still in a good state of preservation. The Sanscrit manuscript in tardive *Gupta* characters, discovered by the writer in the "G" grotto, belongs in all probability to this epoch.

The Buddhist occupation of Bamiyan must have come to an end in the ninth century. During the Mongol invasion Bamiyan was a part of the Khvarezmian domains. Mütügen, the grandson of Genghiz Khan and son of Jagatai, was killed during the siege of Shar-i-Gholghola, the Muhammadan citadel of Bamiyan. In the *Tarikh-i-Jehan Goshai* it is stated that after this event "the Mongol army made all the more haste to conquer the city, and when it was taken, Genghiz Khan ordered as punishment that all living things therein—men as well as animals—be killed; that no prisoners be taken; that not even a child in his mother's womb be spared; that after the capture of the city no one should ever live there, and that nothing should be built on its ruins, which were named Mao Baligh, the 'Bad City'." The chronicle adds: "True,

Phot. M. O. Williams

Crossing the Argandab near Kandahar

Bulalah, near Bamiyan *Phot. M. Morizet*

The Bala Hissar, Herat *Phot. M. O. Williams*

nowadays no animated creature lives there." These events took place in the first months of the year A.D. 1222 (619 Hejira), and Genghiz Khan's malediction still seems to hang over the ruins of Shar-i-Gholghola. Since that time Bamiyan ceased to count among the important cities of Afghanistan, and the abandonment of the great continental highways, supplanted after the fifteenth century by maritime routes, completed the downfall of the old city.

To-day Bamiyan is the residence of a Governor of the third class, who is under the Hakim-i-Qaland, who resides at Charikar. The natural frontiers of the district of Bamiyan, which belongs to the *vilayet* of Kabul, are the Shibar Pass on the east, the Ak Robat Pass on the north, the Band-i-Emir on the west, and the Koh-i-Baba on the south. Bamiyan has also great interest for the ethnologist. The population of the valley (properly speaking) consists chiefly of Tadjiks of the Iranian race, but the tributary valleys are populated by the Hazarah, who represent the Mongol element. In the high valleys of the Foladi live a small number of Kizilbash who are of Turkish origin. The Afghans come to graze their herds in the high valleys from May to September by virtue of the privileges granted to them in 1896–97 by the Amir Abd-ur-Rahman Khan. These Afghans belong to the following clans: the Taraki, the Akakhel, the Omarkhel, the Mandozei, the Dauletzei, and the Ahmedzei Suleimankhel. The first four clans go to pastures of the Band-i-Emir region, the Dauletzei to the heights dominating the Ghandak region, and the Ahmedzei to the high valley of the Foladi and neighbouring pastures. The Tadjik, the Hazarah, and the Kizilbash represent the settled element, while the different Afghan tribes, who obey the rhythm of periodic migrations, represent the nomadic element. In the high valley of the Circa, at an altitude of roughly 8500 feet, the settled population grow two varieties of wheat—an autumn wheat (*tirmai*) which is sown in the second half of October, and a spring wheat (*ba'ari*) which is sown about the end of March. The spring wheat ripens first.

The new road which connects Kabul with Mazar-i-Sharif, the capital of Afghan Turkistan, does not pass through Bamiyan. The ancient track which follows the Bamiyan valley and goes over the passes of Ak Robat, Dandan Shikan, and Qara Kotal before coming to the Bactrian plain, is now almost abandoned. Bamiyan will be connected with the new Herat–Kabul road by a branch which is actually under construction. In this way the picturesque region of Band-i-Emir and the mountainous region of Deh Zengui, which is in the heart of the Hazarah country, will be made easily accessible.

The road from Kabul to Mazar-i-Sharif branches off from the Kabul–Bamiyan road after 123 miles, and, taking an entirely new course, follows the Bamiyan river through grand rocky gorges. Five and a half miles from the bifurcation stand the ruins of the city of Shahr Khoshak and of its citadel dominating a great curve of the river. They were probably destroyed by Genghiz Khan. As far as Doab-Mikhizanin the road passes through the Hazarah country. It does not however go as far as the confluence of the Bamiyan and the Kunduz rivers. Leaving the valley it crosses the Kampirak and the "Caravan" Passes and, following the line of a series of hillocks, comes to the Ghuri plain. Numerous Afghan elements belonging to the Akakhel, Tinzei, Utrel, and Ahmedzei (Suleimankhel) camp there. A little before

Ghuri, at 120 miles, a new road branches off toward Khanabad (Katagan). The new road joins the old one at Haibak. The ethnic elements now show a marked difference, as here we come into contact with the Turkistan Usbegs whom we met at Mazar-i-Sharif. The Tadjiks and the Usbegs live in contact at Balkh, the former capital of Bactria. The city with its many Buddhist and Muhammadan ruins is dominated by an imposing citadel.

The industrious Usbegs have greatly modified the aspect of the country between Akcha and Shibirgan, by reclaiming and cultivating great areas of marshes overgrown with reeds. These areas, uncultivated less than ten years ago, now produce rich corn and cotton crops. The Andkhui region, in the Turkoman country, also shows remarkable development. There the area of irrigated land will be further extended after the construction of a great dam in the mountainous district of Gurzivan. The execution of this project, which is actually under consideration, will relieve the ever-growing over-population of this oasis.

The Turkoman occupy the region between Andkhui, Bala Murghab, and Maruchak. There also, especially between Bala Murghab and Maruchak, vast marshy areas have been reclaimed and transformed into cultivated field and pasture by this industrious population. The cultivation of corn and cotton, the breeding of sheep famous for their skins (*karakul*), and the manufacture of rugs are the principal sources of prosperity in this region. To show the progress achieved in this part of Afghanistan, it is sufficient to compare the actual prosperity with the conditions that existed there in 1885, as described by Colonel C. E. Yate, then a Member of the Commission for the Delimitation of the Russo–Afghan frontier[1]:

> The heat just now in the Maruchak valley is tremendous. Not that I believe it registers anything excessively high by the thermometer, as with a good roof over one's head one would hardly feel it, but in the sun it is overpowering. The whole valley is uninhabited, and the ground is one dense tangled mass of thistles, flowers, grasses, and weeds of every description, standing between two and three feet high, and full of horse-flies and mosquitoes. For the last ten days there has not been a breath of wind, and very often a heavy dew at night. This all dries in the sun and the steam or heat rising from this and the damp ground and the dense vegetation, all now drying up, without a breath of air to carry it off, almost suffocates one.

Colonel Yate however foresaw that a period of tranquillity like that from which Afghanistan now benefits might bring great improvement to the land.

> Once, however, [he remarks] the place has been populated and cleared, I see no reason why it should not become another garden again. With good land and climate, lots of water, and the hills around to go to in summer, what more could settlers want? At present, certainly Maruchak is nothing but a mass of thistles.

The present improvement of this unproductive land has also brought about a change of climate, which, although hot, is now perfectly healthy.

The settled Turkoman are not the only inhabitants of this region. There are also a good number of more or less settled Afghan herdsmen belonging to

[1] 'Northern Afghanistan,' by Col. C. E. Yate, pp. 220–224.

the Ghilzai group (Shakzei and Otak tribes). The Afghans, especially the Ghilzai, have penetrated the whole northern part of Afghanistan, which proves their great vitality. They are particularly numerous in the valley of the Sar-i-Pul river, where they constitute important groups living in contact with the Usbegs. The Afghans are also to be found beyond Bala Murghab, near Moghor, but in this region they belong to the Achekzei tribe. Taking into consideration the fact that the majority of this tribe lives on the Afghan–Baluchistan borders, where they are definitely settled, it must be admitted that this expansion is in reality a quasi-separation.

There are also some other Afghans of the Durrani group in this region, but beyond Bala Murghab the bulk of the population consists of Jemshedi and Firuzkohi, who belong to a group known by the name of Chahar Aimak. My opinion is that these ethnic elements, considerably different in physical aspect from the pure Hazarah, represent a mixture of Hazarah and Tadjik. Colonel Yate rightly places one of the limits of the country of the Firuzkohi at Band-i-Jackar, near the bridge over the Murghab, at a place where the river is greatly constricted. From there the road leads through Kala-i-Nao, Hadji Khoshnor, and Laman to the Zarmast pass, which is about 8000 feet high. The pass is reached by a good road climbing slopes covered by juniper trees. In this way we returned to Herat.

I cannot flatter myself that I have described vividly enough the diverse aspects of this country where the interest of the traveller is so greatly attracted by man and nature. Many observations of the most varied order cannot, alas, find place in the scope of a lecture, and I had therefore to limit myself to a few rapid notes. My sole object has been to show you, by travelling with you along the new Afghan tracks, the quality and the richness of the ethnic elements and the remarkable effort which is being made to improve the general economic conditions of the country.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: The lecturer this evening is Monsieur Joseph Hackin. The Citroën Trans-Asiatic Expedition was one of a series undertaken by the Citroën organization, well known both for the quality of their cars and for new inventions in the direction of motor transport, and also for bringing various remote and uncivilized portions of the world within the purview and reach of civilization, not only in the interests of their own organization but also in the interests of science generally. The first expedition was made across the Sahara ten years ago. Soon after that followed one from Algeria, straight across Africa to the Cape. We are to hear about the third expedition.

Two years ago we had, with very great regret, to announce the death of Monsieur Haardt who was the Citroën organizer of this expedition and of the Trans-Saharan Expedition. Unfortunately, he died in China of pneumonia.

To-night we welcome Monsieur Joseph Hackin, and it is my duty to introduce him and tell you something of his record. He is the Director of the Musée Guimet in Paris, a private museum originated by the gift of a very valuable collection by a M. Guimet, particularly associated with China and the East, Buddhism and Chinese archaeology. Monsieur Hackin is first and foremost an archaeologist, and it seems to me that it has been a great stroke of fortune that the learned Director of that Museum should have succeeded in obtaining leave

of absence to accompany the expedition. Needless to say he has derived very interesting and valuable results from his association with it. It is a great regret to him and, I am sure, to you, ladies and gentlemen, that Madame Hackin, who is with him in London but is suffering from a severe sore throat, for which a cold night in the desert on the way from Baghdad was responsible, is unable to be with us to-night. Our regret at not seeing her here is the greater in that she accompanied her husband during part of the expedition, and it is to her that we are indebted for some of the many beautiful photographs which we shall see on the screen.

Monsieur Hackin then read the paper printed above, and a discussion followed.

The PRESIDENT: Unfortunately, we have not the Afghan Minister in London with us to-night. We sent him a cordial invitation, but he was prevented by an earlier engagement from accepting it. It would have been a great pleasure to welcome him.

Sir Charles Yate, our veteran Fellow, was also unable to come this evening, and I am afraid we have not present many experts on the interesting country we have been hearing about. I will ask Sir Denison Ross, who has known Central Asia well since his early days, to say a few words.

Sir DENISON ROSS: It is my duty to obey the President's commands, and it is a duty which is rendered all the pleasanter by the fact that I have known Monsieur Hackin many years, not merely as an acquaintance but as one of my dearest friends. I am very glad to see him safely back again after such a long absence. I cannot pretend to add to or illuminate anything in the lecture we have just heard, but I would like to raise one or two points which Monsieur Hackin had not time to discuss concerning the extreme interest of the country traversed. I will mention first the artistic aspect, and secondly the historical.

Monsieur Hackin showed us tantalizingly little of the art of the country through which he passed. Herat was at one time the Florence of the East, and was, in the *cinque cento*, the centre and clearing house of all the fine arts of Persia. There Persian book-making and book-writing were brought to perfection; their poets, painters, and architects all excelled. And when we turn to Bamiyan—and when Monsieur Hackin only showed us about 30 feet of the colossal Buddha I felt tempted to call out and ask for more—we realize that that city represents also the apex and limit of Indo-Buddhist art which was the outcome of Indian faith and Greek culture. It is interesting to think that Buddhism never spread west of Bamiyan. How was it that there was that dividing line? Bamiyan is the last outpost of Buddhism. Every pilgrim passed through Bamiyan, but none ever travelled westwards. Can Monsieur Hackin explain why Buddhism never progressed west of Bamiyan? And there also you have the art of Islam which spread over the Near and Middle East, and part of Europe, and northern India, but never penetrated into the extreme East. What we to-day call Afghanistan was the home first of Buddhist and then of Muslim art.

As for the historical aspect, as we look at the pictures of these lofty passes and narrow defiles we recall that great soldiers like Mahmud of Ghazna and the Emperor Babur thought nothing of taking whole armies backwards and forwards over that impossible country, which now can be traversed, though not easily I fear, by the motor car. It certainly still requires something more than mere archaeological enthusiasm to undertake, and bring back the results of, such an expedition as that of Monsieur Hackin.

The PRESIDENT: I am glad to see we have a member of the Afghan Legation with us this evening, and I hope he will offer a few remarks.

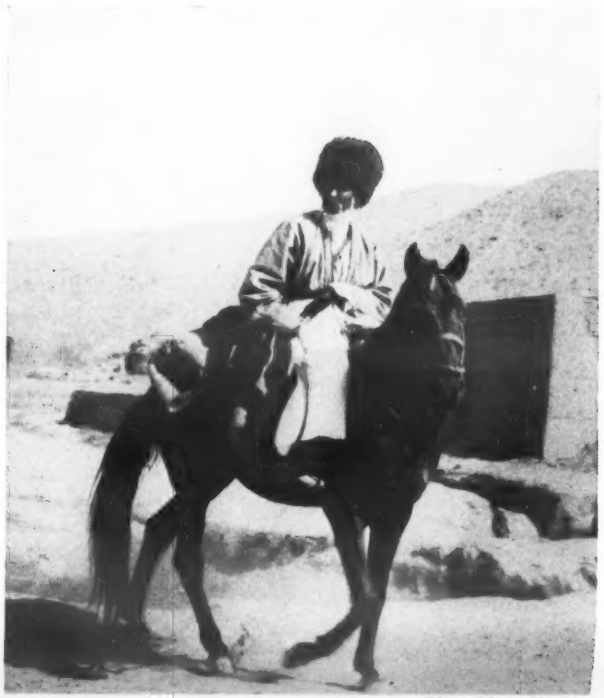
ABDUL QADIR KHAN: I should like to preface my remarks by expressing H.E.

Phot. Mme. Hackin

Sariks Turkoman women, Maruchak

Phot. M. Morizet

Sher Jan, son of the Malik of the Dauletzwi



Phot. Mme. Hackin

A Turkoman, Bala Murghab

the Afghan Minister's very sincere regret that he could not be with you this evening. Unfortunately, he had a prior engagement which deprived him of the pleasure it would have been to him to hear the most interesting and instructive lecture delivered by Monsieur Hackin.

I have been asked to come here as representative of His Afghan Majesty's Government to express appreciation of the trouble taken to organize this most striking expedition to Afghanistan and, secondly, I have been asked by the Minister whom I have the honour of representing to thank Monsieur Hackin for his kindness in coming here and for the wonderful tribute he has paid to Afghans and also to his late Majesty, King Nadir Shah, to whose efforts the country owes so much and whose interest in his country and kindness were so well known to Western travellers.

Sir Denison Ross has spoken from the artistic and historic point of view. I do not think I can add more except to thank the Society for arranging the lecture and, in conclusion, assure you that under the present Government the same facilities as hitherto will be extended to any one who wishes to visit Afghanistan.

The PRESIDENT: We are very much indebted to the representative of the Afghan Legation for being so good as to come and address a few words to us. I know he realizes from what he must have seen at the time how greatly the British public deplore the dastardly crime which deprived him of his royal master, and we to-night have seen fresh testimony of the immense improvement and extension of civilization in all directions which, under his late Majesty's enlightened régime, was making itself apparent. The knowledge among his people that his heart was sincerely devoted to his task enabled him to bring about in a short space of time such changes as those who had known the country a few years previously could hardly have anticipated.

I personally have no experience of the interior of Afghanistan, for I have never got nearer than Jamrud, at the entrance to the Khyber, where, in the early days of our joint career, my wife and I inhabited the fort for some months, when our greatest pleasure was to see the enormous caravans from Balkh and other parts of Central Asia going down to Peshawar.

There is one aspect of the Citroën Expedition which is operating also in other parts of the world. The advent of the motor car means, as it has meant in the towns of England, the eventual disappearance of the horse, and, in the East, the disappearance of our old friend the camel, especially the two-humped camel of Central Asia. Motor transport is gradually bringing out-of-the-way corners of the earth into closer touch with civilization. Places that it once took months to reach can, as the lecturer has demonstrated, now be reached in a few days.

I think you will agree with me that some of the most interesting slides we have seen have been those depicting ladies of Turkistan and elsewhere, of whom, as many of you know, it is extremely difficult for a mere man to obtain photographs. Thanks to the presence of Madame Hackin the expedition was able to bring back those unsurpassed photographs of Central Asian women.

I ask you now to join me in a most hearty vote of thanks to Monsieur Hackin for his kindness in coming over to address us and for his most interesting and informative lecture.

To the question of Sir DENISON ROSS regarding the spread of Buddhism, Monsieur HACKIN replied that Buddhism never extended farther west than Bamiyan because it came up against the official religion of the Sarsanids; this firmly established body of doctrine constituted a state religion which would never have tolerated Buddhism, especially since the latter could count on no support other than its own powers of persuasion.

Phot. Mme. Hackin
A Turkoman, Bala Murghab

Phot. M. Moriset
Sher Jan, son of the Malik of the Daulatzai

THE TUGTILIK (LAKE FJORD) COUNTRY, EAST GREENLAND: *A paper read at the Evening Meeting of the Society on 18 December 1933, by*

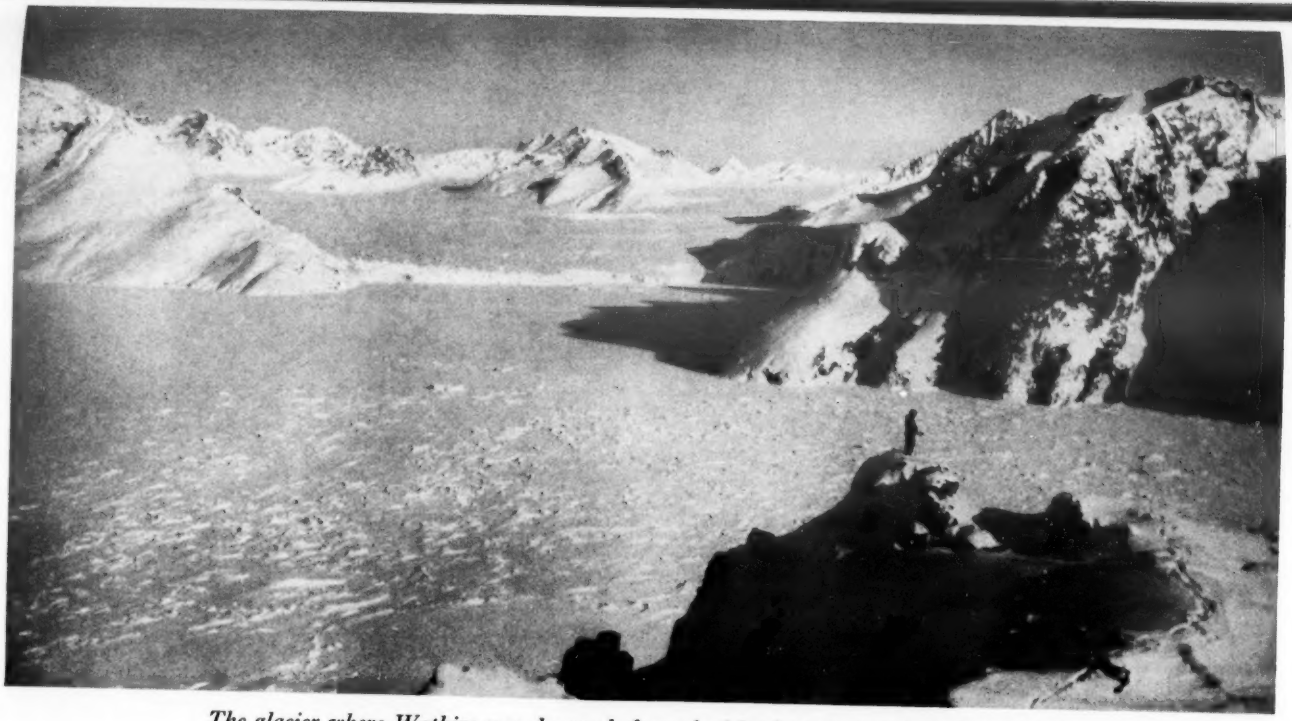
J. R. RYMILL

IN June 1932 Watkins decided to return to East Greenland and continue the work which he had begun on the British Arctic Air Route Expedition. The party under his leadership comprised Quintin Riley, meteorologist; F. Spencer Chapman, ornithologist and photographer; and J. R. Rymill, surveyor. All three of us had been with him on his previous expedition. The primary object of the expedition was to study flying conditions for Pan-American Airways Incorporated, who bore the major part of the cost. The Royal Geographical Society also gave a grant of money and lent instruments, and further instruments were lent by the Air Ministry. We would like to record here our very sincere thanks to Captain Ejnar Mikkelsen, Dr. Knud Rasmussen, and Captain Vedel; without their help and generosity we could not have done nearly as much as we were able to do in Greenland.

While on the British Arctic Air Route Expedition Watkins had decided on the place which he thought would be most suitable for an air port on a Europe-America air line. This was at Lake Fjord, which is about 112 miles from Angmagssalik, and lies to the north. It was named Lake Fjord by Watkins, and takes its name from a large lake $2\frac{1}{2}$ miles long and about 1 mile from the head of the fjord. Watkins thought this lake would make an excellent landing-ground for aircraft, both in summer and winter. The object of the expedition was to investigate the flying possibilities at Lake Fjord by carrying out meteorological observations for one year, and also to do as much survey as possible. The survey was to consist of detailed work in the vicinity of Lake Fjord, including soundings in the lake and also in Lake Fjord and Nigertusok, a long L-shaped fjord to the south of Lake Fjord. We also proposed to do a less detailed survey of the mountainous country between the fjord and the inland ice, and, if possible, to make an attempt on Mount Forel.

We sailed from Copenhagen on July 14 in the Danish Government ship *Gertrud Rask*. This ship visits East Greenland once a year to leave supplies at the two Danish colonies of Scoresby Sound and Angmagssalik. We arrived at Angmagssalik on August 1, after an uneventful voyage. We had planned to transport our equipment from Angmagssalik to Lake Fjord in two motor-boats which we had brought with us: one 18 feet, 9 horse-power inboard motor-boat, and one 20-foot Norwegian whale-boat, fitted with an outboard engine. As we had a great deal of meteorological and other scientific gear with us it would have meant two trips to Lake Fjord. Fortunately we were saved these journeys, as the pack-ice appeared to be very open and it seemed possible that the *Gertrud Rask* could get there. The Danish Government kindly sent a wireless message saying that the attempt might be made. We started on August 8, and after about eighteen hours' steaming through open pack-ice we reached Lake Fjord. Having seen us and our stores safely on shore the ship left early the next morning.

Lake Fjord was very little known before Watkins visited it. It seems that

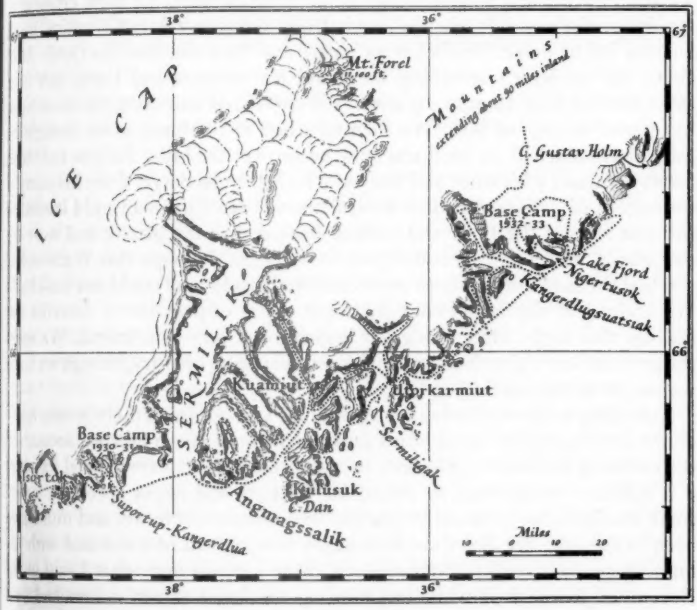


The glacier where Watkins was drowned, from the island at the mouth of Lake Fjord

Memorial raised to Watkins near where he was drowned

"Eriophorum scheuchzeri," a variety of cotton grass, growing on the shores of the lake at Lake Fjord

the only Europeans to have entered it were Amdrup in 1899 and the Danish naturalist, Ch. Kruuse, who camped there on his way from Angmagssalik to Kruuse Fjord in 1901. It was however well known to the Eskimos, who call it Tugtilik, which means "the place where the reindeer live." Watkins did not know this when he first went there, and so called it Lake Fjord. It is north of the usual range of the present-day Eskimos, and although they could give us a lot of useful information about this region, none of them could remember a family having wintered in the fjord, though some of them had called there by umiak in the summer. However it must once have been a popular wintering place, as we found five house-sites and several tent rings. When the Eskimos



Part of the East Coast of Greenland, showing journeys of the Expedition

heard we were going north to winter in Tugtilik, Enoch, one of the best hunters from Kulusuk, a settlement on Cape Dan, decided to come north and winter in Nigertusok, a fjord just south of Lake Fjord. He made up a party of eleven, consisting of three hunters, one boy of about fifteen, three married women, three girls, and a child. Apart from him, the nearest settlement was at Sermiligak, about 57 miles south.

On the British Arctic Air Route Expedition we had learnt to hunt from Eskimo kayaks, and by adopting the Eskimo methods of hunting we proposed to live off the country, thus making an enormous difference to the cost of the expedition. This expedition was away for fifteen months and cost a total sum of £850. We found no difficulty in providing for ourselves, but it took us about half our time.

It had been thought necessary to bring an Eskimo pilot from Angmagssalik, and we had undertaken to return him to his home about 80 miles south of us. Therefore after spending a few days in preparing our camp, Riley and Chapman left in the motor-boat while Watkins and I started hunting in our kayaks. Riley and Chapman returned on August 17, when we all settled down to our usual work. Riley started getting his meteorological station working, Chapman and I began the survey, while Watkins continued hunting.

On August 20 Watkins went off in his kayak at 8 a.m., at about the same time as Chapman and I left in the motor-boat to survey. We spent the morning working on the south side of the fjord, and in the afternoon, after finishing at a station on the south-west corner of the branch fjord, we were crossing to a point on the east side when, about halfway across, we found Watkins' kayak floating full of water. We took it on board, and then searched the fjord. After about half-an-hour's searching we found his trousers and kayak belt on a small ice-floe near an active glacier. We continued searching for some time, but found no sign of him. We then returned to the base, as we thought he might have reached the land and gone home over the hills. He was not there. So we returned with Riley and Enoch, who had walked over from his camp in the next fjord. We searched for several hours; then Chapman and I landed on the east side of the fjord and walked back across the glacier and over the mountains, searching the country as we went, in the hope that Watkins had reached the land but had been overcome by the cold, and could not walk back. We arrived at the base about midnight. It is impossible to describe our feelings that night, after losing our leader and a very dear friend. We spent the next day searching the fjord and the surrounding country, though we knew we had little hope of finding him.

According to the evidence that we did find I do not think there is very much doubt concerning the cause of his death. I will not give a detailed account of the evidence here as it could only be appreciated by an experienced kayaker; it is sufficient to say that we found his trousers and kayak apron on a very small ice-floe close to an active glacier. His trousers were wet and must have been in the sea. We also found his kayak floating full of water and with the hunting gear not seriously out of place. May I repeat here what I said in the December *Journal*? If while out hunting the kayak screen is knocked by a piece of ice it is likely to get disarranged, and if this happens it is necessary to get out of the kayak for a few minutes to right the screen, as it cannot be reached from the cockpit. We believe this happened to Watkins' screen, and he, thinking he would only be a minute, landed on a small floe in a dangerous locality. While on the floe a large piece of ice broke off the glacier, starting a wave big enough to upset the floe on which he had landed. There was a strong wind blowing off the glacier at the time, which would carry his kayak away while he was climbing back on to the floe. He then took off his trousers and kayak apron and tried to swim after his kayak. It would be impossible for him to get into his kayak in the water, and he must have been overcome by the cold before he could get it to an ice-floe. This of course is only a theory, but from the evidence we found and from personal experience it seems the only possible solution to a great Polar tragedy.

We decided to leave the next day for the wireless station at Angmagssalik,

as we had no transmitter at our base. It would be necessary for us to hurry, as we were expecting Captain Ejnar Mikkelsen to arrive in Lake Fjord at the beginning of September. He was returning home with his expedition from the Blosseville coast. The Eskimo population on the east coast is steadily increasing, and the hunting in the Angmagssalik district is limited. Captain Mikkelsen had seen the advisability of getting the Eskimo to move farther afield. With this object in view he had erected houses in Kangerdlugsuak and Mikis Fjord, and intended to leave one in Lake Fjord as a resting-place for the Eskimo as they travelled to and from Kangerdlugsuak. Captain Mikkelsen had very kindly offered Watkins the use of this house.

While we were at Angmagssalik we had a wireless from him saying that he would be in Lake Fjord on September 1. We had meant to visit the various settlements in the Angmagssalik district to buy sledge dogs, and had towed the whale-boat from Lake Fjord in which to fetch them; but as it was necessary to meet Mikkelsen at Lake Fjord we would not have time to do this. We therefore decided to leave the whale-boat at Angmagssalik and come down again after we had seen him.

We left on August 29, and after being considerably delayed by rough seas, we arrived at Lake Fjord five days later. Mikkelsen was already there, having arrived the night before. He spent the day in Lake Fjord, getting up the framework of the house and also completing the floor and the outer wall at one end. As we had missed a great part of the summer hunting season, when seals are most plentiful, he very generously gave us an emergency supply of his own provisions and sold us, or rather took a signature for, further stores which were not his to give, in order to help us over the bad hunting period, which would be the last part of November, December, and January.

Mikkelsen left us on September 4. Riley and Chapman left the same day for Angmagssalik, to buy the sledge dogs, while I remained at Lake Fjord to finish the house, tend our fishing nets, and carry on meteorological observations. The east coast Eskimo do their travelling mainly by boat in the summer. They have therefore bred a small fast dog which is very good for short hunting trips, but can only pull 50 or 60 lb. It would be necessary for us to have about twenty of these dogs to do the trips which we proposed making in the spring. But as it would be impossible to feed so many until the fjords froze over sufficiently to let us start fishing for sharks, Chapman and Riley were only to buy ten or twelve dogs, which would be enough for working about the base and for short journeys.

While they were buying dogs the American flyer, Hutchinson, had made a forced landing with his family about 60 miles south of Angmagssalik. Riley and Chapman were asked by the Danish Governor, and also from America, if they would look for him. This delayed them considerably, and they did not return to Lake Fjord until September 16. They were brought back by Lieut.-Commander Riis, in the *Maagen*, a Danish naval ship which had been sent to help Hutchinson. But he had already been picked up by the British long-liner, the *Lord Talbot*. Lieut.-Commander Riis very kindly offered to call at Lake Fjord on his way to Denmark. This was a tremendous help to us, as the coast was now free from pack-ice and Riley and Chapman might have been held up for weeks in their open boats by the stormy weather and resulting

big seas. Chapman had been having trouble with his knee ever since we had arrived in Greenland. He had injured it the year before while on the British Arctic Air Route Expedition. It had been operated on in England, but it now showed signs of water. We decided that the best thing for him to do was to go to bed until it was better. As it was always necessary to leave a man at the base to carry on the meteorological observations we would now only have one man available to do any travelling that was needed. It was necessary to put a depot for the first inland journey at the head of Kangerdlugsuatsiak. This was a journey of some 78 miles, and took four days owing to the rough seas. I returned from this journey on September 29.

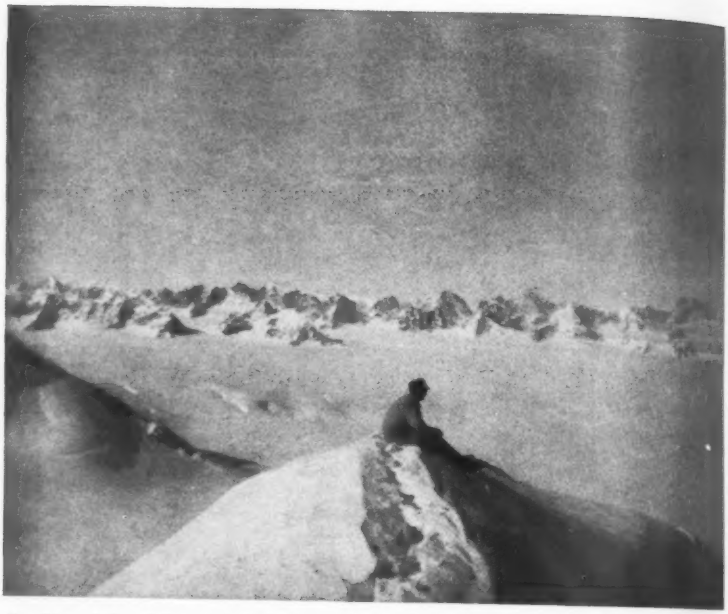
By the beginning of October Chapman's knee was much better, and he was able to walk for short distances. He and I continued hunting until the middle of November to lay in a supply of food for the winter. On November 10 we decided to pull the boats out of the water for the winter, although the fjord was not yet frozen over; the continual bad weather was driving large ice boulders on to the beach and the boats were in danger of being seriously damaged. The salmon had left the fjord and gone up to the lake about September 13. We were not able to catch any more fish until November 20. By this time there was about 1 foot of ice on the lake, and by making a series of holes about 20 feet apart we were able to pass a net on the end of a long rope under the ice by means of a pole. Then, by breaking the ice on the two end holes we could pull the net in and out whenever we wanted fish. By using this method we had a supply of fresh fish all through the winter.

By November 21 enough snow had fallen to let us start sledging, but as there was a wide belt of mountains between the fjord and the inland ice the föhn winds could not reach us. This meant that we never got enough wind to put a bearing crust on the snow. As we had precipitation on forty-three days in December and January, the snow became so deep that it was quite impossible to do any journeying other than short hunting trips until the beginning of February. On the few good days in December and January Riley and I worked on a theodolite triangulation of the country near the base. We proposed to extend this and fill in the details by plane-table when conditions improved.

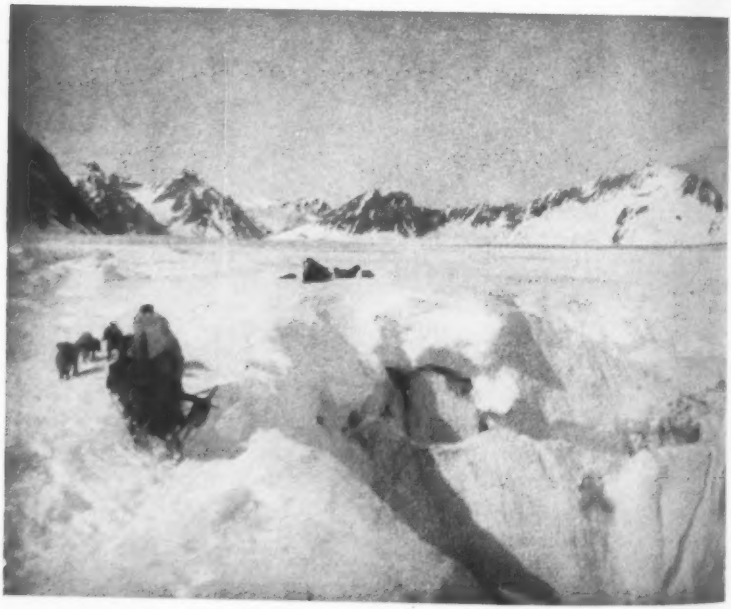
Although the surface was still bad in the beginning of February, the weather had improved, so Chapman and I decided to leave for Angmagssalik on the 8th. We started with a clear sky, no wind, and a temperature of −15° F., ideal conditions for sledging on the sea-ice. The pack-ice had been frozen on to the coast since the end of January. We proposed to travel on this as far as the Eskimo settlement at Sermiligak, a distance of 76 miles. The remaining 55 miles would then be over the smooth fjord ice, or over islands and points, when the strong current prevented the ice forming into a bearing surface. On the second day out it began to snow, and continued for two days. This new snow, falling on top of the deep snow which was already lying, made it impossible to travel more than a few miles a day. On the 14th we camped on the sea-ice, still about 34 miles from Sermiligak. In the night a blizzard started to blow from the north-east; the wind became so strong, and the flying snow so dense, that it was impossible to see anything outside the tent. About 1 o'clock in the morning the ice began to break up. A crack appeared across the tent; it

Tide crack opening up in the spring

Ice in the north arm of Lake Fjord breaking up in the spring



Looking inland from the farthest point reached on the second inland journey



Crevasses

widened to about a foot, and we could see the water below. We spent a most uncomfortable night sitting fully dressed, one on each side of this crack. The wind died down about 10 o'clock in the morning, leaving the ice considerably broken, with open water about a quarter of a mile behind us. However the wind had improved the surface, and we arrived at Sermiligak two days later. We were disappointed to learn that we could not buy dogs here, as the natives had lost three teams through the ice a few days before, and the settlement was very short. We continued to Angmagssalik, arriving on February 22, having stopped at several settlements to buy dogs on the way.

When we arrived at Angmagssalik we were told that nothing was yet known regarding the arrival of the Danish supply ship the next year, but a Danish expedition was coming to spend the summer on the east coast. We could not arrange anything definite about getting home, and as we had no wireless at Lake Fjord it would be necessary to come down again early in the summer. After making our dog teams up to ten each we started back to Lake Fjord. The surface was still heavy, but with our large teams we were able to do the 131 miles in five travelling days, arriving on March 5. We were using the ordinary type of Nansen sledges. These were not nearly strong enough, and we had to rebuild them after any journey which included pack-ice travelling. There had been a shortage of food among the Eskimo, and consequently our new dogs were in very bad condition. It would be necessary to fatten them for several weeks, before they would be fit to start on any inland journeys. By March 20 they were fit enough to start, but we were delayed by bad weather for another five days.

We intended to travel on the sea-ice to the head of Kangerdlugsuatsiak. This is a narrow fjord about 23 miles long, with a large glacier at the head. We proposed to go up this glacier, surveying the country on the way, and if possible reach the inland ice and make an attempt on Mount Forel. Mount Forel was discovered by the Swiss explorer De Quervain in 1912, when he crossed the inland ice from Jakobshavn to Angmagssalik. He measured it from a distance and found its height to be about 11,000 feet. In 1931 Stephenson and Wager attempted to climb it by approaching it from the west. Unfortunately they were turned back by a very steep ice-slope when they were about 700 feet from the top. But they measured its height more accurately, and found it to be 11,100 feet, the highest known mountain in the Arctic, until Watkins, while flying from Mikkis fjord in 1930, obtained a photograph of the country north of Kangerdlugsuak which revealed a very high range of mountains. The range was about 60 miles inland and, judging from the height of the surrounding mountains, must be about 12,000 feet.

Our sledges were lightly loaded, and they arrived at the depot, which we had left at the head of Kangerdlugsuatsiak, in good condition. The glacier had been very active all the winter, pushing out great masses of ice which formed pressure ridges extending far out into the fjord. There were steep cliffs on either side of the glacier, and the only approach lay over the fallen ice. This was quite out of the question, and we had to look for another route. We found this up a previously undiscovered glacier, flowing into the north arm of the fjord. This glacier had been fairly active, but the conditions were comparatively easy. It was badly crevassed for about the first 5 miles, and then

became smoother, but still rose steeply. These good conditions did not last for long, as the main glacier was being broken up into small tributary glaciers. Most of these tributary glaciers were badly crevassed, and we were being continually turned to the north, and getting farther away from Mount Forel. We would stop at intervals and climb mountains to take rounds of angles and also to see what the country looked like ahead. Travelling was slow, as it was often necessary to go ahead roped together, and find a way for the sledges. After penetrating some 40 miles from the coast we climbed a mountain 7000 feet high. We had an excellent view all round us; the mountains were stretching away to the west and north, as far as we could see. We were now in a region which the existing maps portray as inland ice, but the mountains must have continued for another 40 or 50 miles. There were many peaks and ranges, comparing favourably with the Forel range—in fact it was impossible for us to pick Forel out from the mass of peaks which we saw to the south-west. We could see no inland ice however, and as the crevasses looked very much worse ahead we decided to turn back. If we had had a party of three I think we could have reached the inland ice, but as there were only two of us we decided that the risk was too great. It is almost impossible for one man to pull another out of the type of crevass which we were meeting. We followed our route back to Kangerdlugsuatsiak, putting more detail into the survey on the way. We returned the 39 miles from the head of Kangerdlugsuatsiak in one day, arriving at the base on April 5, our Nansen sledges again collapsing on the rough pack-ice.

It would be necessary to do two more inland journeys to complete the area which we proposed to map. But we intended first to do some of the local survey which could only be done from the sea-ice. This local survey was extended to cover an area of 225 square miles, and was plane-tabled on a scale of 1 in 62,500. While out hunting on the pack on April 16 we saw that the ice was beginning to break up. There were a great many cracks, and several large leads had appeared. We had supposed that the fjord ice would be good until the middle of May. We got all our supplies for the second journey up the glacier in the north branch of the fjord. Just as we had finished, on April 28, a heavy swell reached the fjord and broke up the ice, cutting us off from our depot. As all our remaining dog food was in this depot, it was necessary for us to find a way through the mountains.

The local survey was finished by May 10, but we were delayed by fog and bad weather for a few days. Eventually we got away on May 17 and reached the depot the same night. On this journey we intended to travel up the glaciers towards the inland ice, until we connected with the survey made on our previous journey, and then find a way down one of the two glaciers which flow into Nigertusok fjord. The survey which we did on these journeys was compass traversing checked with astronomical positions. We would leave our sledges on a glacier, and climb a mountain whenever necessary. Some of the mountains could be climbed on skis, but as the sun temperature at midday was by now quite hot, the rocks were reappearing from under the snow. We would therefore abandon our skis when we left a glacier and continue climbing on the rocks. We were again troubled by the badly crevassed and broken nature of the country, but eventually connected with our previous journey.

We then turned south and found a comparatively easy route down the glacier into Nigertusok, and reached the base on May 26.

We now had one short trip left to do. This was in an area to the west of Nigertusok, which we had not been able to see from either of our other two journeys. At this time of the year the weather is generally very bad, and as we seemed to be in for a short period of good weather, we wasted no time, but left the next day. We could not be in the mountains long as the ice in Nigertusok was becoming very rotten, and the tide cracks were beginning to open. If the ice broke up we would be cut off from our base. However we now knew the route up the glacier, and reached the country which we wished to survey without any difficulty. One can always find a possible route up these glaciers by following along the edge just where the glacier meets the land. After finishing the survey we returned over the same route and got back on the night of the 29th. Most of the snow had now left the hills, and as we still wished to sledge, we were forced to travel over rocks or turf, and sometimes swim our dogs through the rivers which were very much swollen by melting snow.

The beginning of June was spent in repairing the boats, mending the fishing nets, and doing the many other things which must be done at the beginning of the summer. Towards the middle of June the pack-ice looked open enough to let a small boat work along the coast, although it would have still been far too tight to allow a ship of any size to get through. By working with the tide and the strong currents which run between the islands it is nearly always possible to take a small boat along the shore leads.

Riley and I left for Angmagssalik on June 18, leaving Chapman to carry on the meteorological observations. We had no kayaks with us on this trip, as there was still winter ice at the heads of most of the fjords. We were able to shoot seals for food, as they lay on the ice basking in the sun. There were also many gulls and guillemots nesting along the cliffs.

Enoch had left a few days before with his umiak to hunt narwhal in Kangerdlugsuatsiak. We reached his camp the first day, but an on-shore wind sprang up in the night and brought the pack-ice tight against the coast. We were forced to remain in Kangerdlugsuatsiak for five days, until the wind changed and opened the shore lead. We got away on the 18th, and did about 10 miles, when we were forced to anchor, as there was not enough visibility owing to a heavy snowstorm. We now got another on-shore wind. We were anchored in a bad place, but by blowing up a floe with dynamite we were able to work the boat behind some protecting rocks, where she would be safe from the ice. The bad weather continued, and as we were anchored under a cliff, we were in danger of being hit by falling stones. These stones are loosened by continual thawing and freezing, and we could hear them falling all round us. By using some more dynamite we were able to work our way into a neighbouring fjord, where we found a good anchorage for the boat. We waited here for ten days, until the ice opened up again. We then continued on to Angmagssalik, but found the entrance to the harbour blocked with ice. As there was a gale blowing from the north-east we decided to shelter at the Eskimo settlement of Kulusuk on Cape Dan. We stopped here for two days and eventually arrived at Angmagssalik on June 30.

When we arrived we were told that Dr. Knud Rasmussen had already left

Denmark with a large expedition to spend the summer on the east coast. We decided to wait until he arrived at Angmagssalik. Captain Vadel arrived on July 13 with the Danish inspection ship *Nordstjernen*, bringing the greater part of Dr. Rasmussen's expedition. Dr. Rasmussen arrived the next day in his 22-ton ship the *Kivioq*. Dr. Rasmussen and Captain Vedel immediately offered to take us as far as Iceland when the *Nordstjernen* returned to Denmark in September. Not only did this give us longer in Greenland, but it saved us a great deal of expense. Dr. Rasmussen also very kindly offered to pick up our meteorological and other equipment at Lake Fjord as he returned from Kangerdlugsuak.

Riley and I started back to Lake Fjord on July 16. The ice conditions were now good, and we arrived on the morning of the 18th at 3 a.m. We found that Enoch had already left Kangerdlugsuatsiak and was camping near our base. Seals were scarce at this time, but as there were plenty of salmon in the fjords we had no trouble in netting enough to feed the ten extra people. We decided to continue the meteorological observations until August 18.

If Lake Fjord is to be used as an air port it will be necessary to know the channels between the islands, and also the anchorages. We therefore started sounding with a sounding machine mounted on the back of the whale-boat. We did soundings in Lake Fjord and in Nigertusok, and by carrying a kayak up to the lake we were able to do a series of soundings there.

Enoch left for his home at Kulusuk on August 17. Chapman, who wished to continue his ornithological work in that district, went with him. They travelled in the usual Eskimo manner; the women rowed the umiak, which Enoch steered, while Chapman and the other hunters went in their kayaks. Riley closed his meteorological station on the 18th, after having kept unbroken observations since September 4 of the year before. We packed our heavy gear and left it to be picked up by the *Kivioq* and started south on the 19th. We proposed to do a plane-table survey on a scale of 1 in 62,500 from Lake Fjord to Sermiligak, about 130 miles of coast-line. This would be a continuation of the survey done by Stephenson on the British Arctic Air Route Expedition. The pack-ice had by this time left the coast, and we started in perfect weather. The good weather continued for a week, and it was a very real pleasure to travel through these beautiful East Greenland fjords when there was no pack-ice to worry about. But the stormy weather which is usual on this coast in the later summer started before we left Kangerdlugsuatsiak, and gave us a good deal of trouble with our small open boats on the more exposed parts of the coast. We reached Sermiligak on the 27th. We were expecting the *Nordstjernen* to sail on September 10, so after three days in Sermiligak we went on the 57 miles to Angmagssalik. We were again forced into Kulusuk by the bad weather, when we met Chapman here, and after being delayed for four days we reached Angmagssalik on September 4.

We learnt on arriving that the *Nordstjernen* had been delayed and would not sail until the 17th. Chapman and I therefore returned to Sermiligak to finish off some astronomical work which we had not had time to do on the way down from Lake Fjord. We returned to Angmagssalik on the 16th, and left in the *Nordstjernen* for Iceland on the 21st.

Before we left Lake Fjord we raised a memorial to Watkins, near the place

Sea ice broken up by the active glacier in the north branch of Kangerdlugwatsiak, up which the first inland journey was made

Finding a route for the sledges up a small glacier

Motor-boat and dinghy in safety behind reef of rocks when held up by heavy ice

Ice boulders washed up on the beach by the autumn storms

where he was drowned. Any useful work that we may have done in Greenland was his accomplishment. We were merely carrying out his ideas as well as we could.

APPENDIX I.—METEOROLOGY

QUINTIN RILEY

The meteorological work was confined to fixed time observations at the base station, 66° 20′ N., 34° 59′ W., three times a day, at 10.00, 16.00, and 22.00 hours L.M.T., or 13.00, 19.00, 01.00 hours G.M.T. These were the same as the hours for observations by the International Polar Year Expeditions. Complete observations cover a period from 5 September 1932 to 18 August 1933, but the log includes August 1932 and to the end of August 1933. The instruments used were wet and dry bulb thermometers (Fahrenheit scale), maximum and minimum thermometer, the thermograph and the hygrograph, the foregoing being placed in the Stevenson screen 50 yards from the house; there was also an anemometer of the Robinson revolving cup type, while inside the house were a Kew-pattern barometer and a barograph—readings being taken in millibars and the thermometer on the barometer being read in absolute. There was also a Fineman's nephoscope, but this instrument was unfortunately of little use.

All the instruments behaved well, but there was considerable trouble caused in the winter owing to the screen becoming filled up with drift-snow. During most of the winter the screen was placed on the roof of the porch of the main house, but even here it was not entirely immune from this nuisance.

Eye observations were made of general weather conditions and wind, cloud amount and kind, and visibility. It was found more desirable to estimate the wind according to the Beaufort scale, merely using the anemometer as a check and for recording gusts. Owing to the formation of the fjord, which is narrow with mountains rising steeply on each side, the anemometer was subjected to eddies which would not have given an accurate reading of the actual wind.

The observations of the weather here give a very different picture from those recorded at the base of the British Arctic Air Route Expedition, 65° 39′ N., 38° 38′ W. in 1930–31, which may be accounted for by the different exposures of the two places. The base of the previous year was situated at the head of a small fjord into which the inland ice itself drained and the coastal mountain belt was not more than 3 miles wide. The Lake Fjord base was at the head of a small fjord with the coastal mountain belt nearer 80 miles wide behind. The difference in weather was chiefly marked in the lack of gales at Lake Fjord and the distribution of fog.

At the earlier base fog was rare over the station in summer (only four days from May to August), while at Lake Fjord summer was the foggy season with thirty-two days on which there was fog recorded from April to August compared with four days from September to March. The maximum distance visible was only just over 5 miles away, farther objects being impossible owing to the enclosed situation. When there was no doubt that the air was sufficiently clear for objects at a much greater distance to be distinguished the appropriate small letter was used, and this occurs at 54 per cent. of the observation hours. Fog or mist only occurred on thirty-six days in the total period of observations, the lowered visibility on other days was caused by precipitation or drifting snow.

Observations of wind were chiefly notable for the absence of gales. At the base of 1930–31 there were forty-two days on which force 8 or above (often exceeding force 12) was recorded. They were evidently examples of the usual Föhn phenomenon of Greenland. But at Lake Fjord, owing presumably to the

broken nature of the country between the base and the inland ice, a gust of force 9 was only once recorded. On eighteen days only, during the whole period, was force 4 exceeded. The percentage frequencies of observations of calms observed at fixed hours on the previous expedition averaged 58 in winter months and 47 in summer months. At Lake Fjord there were ninety-three days on which the wind did not exceed force 1 during the whole day. The direction of the wind was largely regulated by the formation of the fjord and the wind had little alternative than to blow up or down the valley of the fjord or lake. This is an important factor when considering the use of the lake as a landing-ground for aircraft. (The valley is open at both ends, so it would not matter to operating aircraft which way the wind was blowing.) Owing to the absence of gales the freeze-up of the lake in the autumn took place very quickly. There were only ten days in October from the time that the lake was completely open until it was completely frozen over to a thickness of 9 inches. There is however another lake near the Danish colony at Angmagssalik which did not freeze until November. The break-up in the spring took somewhat longer. The ice was pronounced unfit for ski craft on June 2 and was not completely clear of ice until June 28. During this time the lake at Angmagssalik was completely free from ice, the break-up there having taken place much earlier. From reports of natives this may be taken as a general rule each year.

The temperature observations were generally what was expected, the mean for the various months being a little lower than the normal values for Angmagssalik. The highest and lowest recorded temperatures were 63° F. in September 1932 and −14·5° F. in January 1933.

Precipitation occurred on 147 days during the period under observation during some part of the day. This is only four more than the average annual number of wet days for England and Wales 1917–32. From October to April it was nearly always in the form of snow, but rain fell on two or three days in every month except February.

The pack-ice conditions off the Greenland East Coast need some comment. In the four autumns we have spent on the coast we have found that the pack-ice disappeared by the end of August to reappear in December. Of course this may have always been so, and as ships always used to leave the coast in August when there is still pack, the reports of continued ice consequently appeared in pilot books. Conversation with the Eskimos however leads one to believe that these reports were correct, and that the ice conditions are undergoing a change. Apparently in their fathers' and grandfathers' time there was ice all the year, but during the last twenty years the ice has usually disappeared in August as we found. There is another point concerning the pack-ice which needs mentioning. It is well known that the Polar current drifts from north to south down the east coast, consequently masters of ships making for Angmagssalik like to get into the ice well north of the colony so that if they get stuck they are drifting toward their objective instead of away from it, which would be the case if they got stuck south of Angmagssalik. In theory of course this is perfectly sound, but in practice it does not seem to be so good. The missionary at Angmagssalik, Pastor Rosing, told us that in all the years he had spent at Angmagssalik, ten as a missionary and many as a small boy, every ship that has tried to get through the ice north of Cape Dan has got stuck, but they could generally have come through very easily from the south. This was very plainly demonstrated this year.

Dr. Knud Rasmussen arrived in July last year with two ships. One, *Nordstjernen*, got a wireless message telling her to come south of Cape Dan, which she did, and came through the pack in six hours. The other, the *Kivioq*, did not get

the message as her wireless aerial had blown away, and, coming into the ice north of Cape Dan, she was four days before reaching Angmagssalik.

In the meteorological work I was greatly assisted by the close co-operation and assistance of my companions, to whom I tender my most sincere thanks. When Rymill and I were away for over a month in June and July Chapman was completely alone; he never missed an observation and was never late in taking one. He had no Eskimos to remind him of the time as I had when he and Rymill were away in February.

Whether the Arctic Air Route will one day be established I do not know, but if it is, there are two people to whom the credit is due: the first of course is Watkins, and the other is Rymill, who carried on his work when things were very difficult.

Distribution of weather during months under observation

Month	*Visibility*		*Wind*		*Cloudiness*		*Precipitation*	
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
September	1	12	8	1	4	10	–	8
October	1	20	14	0	8	10	5	2
November	0	8	8	2	5	10	8	3
December	0	3	6	1	3	16	18	4
January	0	8	1	3	5	16	20	1
February	0	19	1	2	16	5	7	0
March	2	13	9	4	6	11	16	2
April	6	16	17	0	15	11	6	2
May	4	10	13	3	3	12	4	4
June	11	11	9	0	7	6	1	13
July	10	20	3	0	12	1	0	11
August	1	10	4	2	4	1	0	12

Column *a* gives the number of days in each month on which fog was recorded at some time during the day.

Column *b* gives the number of days on which visibility was at maximum all day.

Column *c* gives the number of days on which wind did not exceed force 1 all day.

Column *d* gives the number of days on which force 4 or over was recorded during some time in the day.

Column *e* gives the number of days on which cloud was above 10,000 feet or did not exceed 3/10 of the sky.

Column *f* gives the number of days on which the amount of cloud at some time during the day exceeded 3/10 and was below 10,000 feet.

Column *g* gives the number of days on which precipitation in the form of snow was recorded during the day.

Column *h* gives the number of days on which precipitation in the form of rain was recorded during the day.

APPENDIX II.—PRELIMINARY ACCOUNT OF THE NATURAL HISTORY WORK

F. SPENCER CHAPMAN

Detailed observations were made throughout the year on the distribution and habits of the birds seen at Lake Fjord itself and on journeys farther south. These notes correlate and make a striking comparison with similar work carried out at Base Fjord 1930–31, in a very different type of country (*Geogr. J.*, vol. 79, p. 493).

A series of bird skins and stomach contents of birds were brought back, in addition to collections of plants and insects.

Birds

Of the land birds the Snow Bunting was the commonest, outnumbering the Greenland Wheatear as a breeding species by six to one (nine to four at Base Fjord). Although the Lapland Bunting, Greenland Redpoll, and Meadow Pipit did not seem to be breeding, they all appeared at Lake Fjord soon after the nesting season. Snow Buntings, Greenland Redpolls, and considerable numbers of Horniman's Redpoll occurred till mid-November feeding on the seeds of plants which still protruded from the snow.

The Raven nested in the neighbouring fjords, and birds were present practically throughout the winter, following the Polar Bears about for scraps when they were no longer able to secure food for themselves. Ptarmigan were surprisingly scarce: I do not think that more than two pairs nested in the whole Lake Fjord district, nor was this number augmented at any time by immigration. Snowy Owls were sometimes seen in the autumn as well as both dark and light forms of the Falcon: a pair of dark Falcons nested immediately above a large Iceland gullery a few miles to the south of the base. Examination of stomach contents showed their chief prey to be Little Auks. The Peregrine Falcon was occasionally seen in July and August.

As in 1930, Barnacle Geese were seen beside the lake in July, but did not seem to be nesting. Large flocks of Pink-footed Geese were seen passing over on migration, while specimens of White-fronted and Brent Geese were secured in October. Curiously enough the Brent Geese were feeding on crowberries.

Of the ducks, the Mallard was only once recorded; three Teal—rare visitors to this coast—appeared in May; a pair of Red-breasted Mergansers were often seen and may have attempted to nest. Eiders—especially drakes—became plentiful in June as soon as any open water appeared; only a few pairs bred at Lake Fjord, but they were abundant again in the autumn, though the drakes had by that time disappeared. A pair of King Eiders visited the fjord in October. Long-tailed Ducks occurred as long as there was open water, though there was no evidence of breeding; in October and November parties of a dozen or so were seen almost daily. A pair of Common Scoters spent all July in the fjord; this is the first record I can find of this species for East Greenland.

Of the waders, Ringed Plover, Turnstone, Dunlin, Purple Sandpiper, and Red-necked Phalarope were present, though sparingly, throughout the breeding season, but only the first-mentioned was proved to breed. Considerable numbers of immature Turnstone visit this coast in August and September, and the Purple Sandpiper also seems to increase in numbers in the autumn, some birds remaining till November. Occasional Sanderling, usually absurdly tame, occurred in August, and a pair of Little Stints were secured at Kangerdlugsuatsiak at the end of September.

Red-throated Divers breed in this district, though the Great Northern Diver does not occur north of Sermiligak. It is interesting that the Arctic Tern seems to be entirely absent on this coast from Sermiligak northward to Kangerdlugsuak and possibly as far as Scoresby Sound, although it breeds in great numbers to the north and south of this area.

A few immature Puffins seem to occur regularly in September near Sermiligak and one was found in Nigertusok: at Cape Dan, for some reason, this bird seems to be unknown. The Fulman Petrel was plentiful in the open sea, but rarely entered the fjords except in stormy weather: the darker form occurs very sparingly, apparently irrespective of season or latitude.

Among the gulls the Iceland Gull was the commonest, as there were large gulleries both to the north and south of Lake Fjord; it was surprising to find a Little Auk, complete except for the head, in the stomach of a young Iceland Gull which had not yet left the nest. The Glaucous Gull was plentiful, though it nested in smaller parties than the Iceland Gull or in solitary pairs. Great Black-backed Gulls wandered as far north as Nigertusok in autumn, when the Ivory Gull was occasionally seen outside the fjord. Adult and immature Kittiwakes appeared in great numbers after nesting farther south; they remained as long as there was open water.

The diving sea-birds outnumbered all others and were most useful to us economically. The Black Guillemot nested in thousands at suitable places along the rocky outer coast, their chief food being the smaller crustacea which were present in the fjord in vast numbers. In August and September packs of Black Guillemots would be seen swimming southwards in curiously close formation. Brunnick's Guillemot and the Little Auk bred farther north and reached the open sea and fjord mouth in late August. On 10 October 1932, a snowy foggy day, we saw hundreds of Black Guillemots, Brunnick's Guillemots, and Little Auks passing south in continuous small parties; two days later there were none to be seen.

Plants

About 130 species of flowering plants were brought back, including meadow rue, Iceland poppy, arabis alpina, 4 drabas, several cerastiums and potentillas, dryas, 8 saxifrages, 4 species of willow herb, 2 sedums, 3 erigerons, 2 graphaliums, 3 campanulas, 2 gentians, 2 orchids, 2 cassiopes, pyrola, diapensia, 2 veronicas, 4 species pendicularis, pinguicula, a dwarf birch, 5 varieties of dwarf willow, dwarf azaleas and rhododendrons, and various kinds of fern.

Insects

Some fifty varieties of insects were collected, including several species new to the British Museum collections. One butterfly was brought back—a kind of fritillary—four species of moths, a ladybird, a weevil, and many different kinds of flies.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: The paper to which we are going to listen to-night is, as one may call it, the sequel to an earlier expedition; and it is difficult to refer to the expedition led by our lecturer without reference to the earlier expedition. As you know, the East Coast of Greenland is the subject of the lecture. Those of you who read the Society's *Journal* regularly, and most of those here probably do, will have noticed to what a great extent the attention of explorers and the Governments concerned has been directed to Greenland in general and the east and west coast in particular.

The reason for the attraction of so much attention to Greenland in the last few years is that it seems to furnish convenient bases for a possible air route for civil aviation from England to Canada and America, a route which would take a line somewhat as follows: London–Aberdeen–Faroes–Iceland–East Coast of Greenland–West Coast of Greenland–Baffin's Bay–Hudson's Bay–Winnipeg–and so on. It is a great idea, and of course the main factor is that it avoids the dangerous crossing of the South Atlantic on what is known as the southern route.

Gino Watkins—I call him Gino although I knew him very slightly, but he is known now to all of us as Gino Watkins—after gaining a considerable experience from his previous expeditions to Labrador and Edge Island, when he came back to England in 1930 was bitten with the idea of this British Transarctic route

between England and America, and he organized and carried out in 1930–31 an expedition to the East Coast of Greenland. His object was generally to explore the possibilities of this British Northern Arctic route. He took thirteen comrades with him, mostly young University men, friends of his own, and they were away fifteen months. They did very useful work and returned at the end of October 1931.

On 12 December 1931, just two years ago, Gino Watkins gave a paper here on the results and experiences of that expedition. All who heard that lecture will never forget the wonderful photographs he showed illustrating, *inter alia*, the party's experiences and the extraordinary dexterity which they had achieved in the use of the Eskimo kayak. We little thought when we saw Gino Watkins on the film, turning a somersault, as it were, with his kayak and able to do practically what he liked with it, as if the little craft were part of the man (as indeed it must be in these cases), that in less than two years he would lose his life in that tragic way in the very kayak now to be seen in the Society's Museum, on the wall above Mawson's sledge. As I have already told you, I knew Watkins very slightly, so I can best leave others to sing his praises.

On his return to England from the 1930–31 Expedition Watkins at once set about to try to organize a more ambitious expedition to the Antarctic. He did all he could in that direction for some months. He had an excellent scheme, entirely supported by this Society, and he left no stone unturned to try to obtain the necessary funds for carrying out that expedition. You could not have had a better man. He had completely established his reputation as a leader, and there was every chance of his carrying through a very fine piece of work in the Antarctic. But he entirely failed to raise the money, and in a spirit of disappointment—he did not want to remain idle—he took three of his old companions of the 1930–31 Expedition, our lecturer being one of them, and went off on a very modest expedition to the same region in Greenland to continue the work of the 1930–31 party. It is that work and that expedition we are now to hear Mr. Rymill describe.

Mr. Rymill had experience in Canada and he was with Gino Watkins, as I have told you, on the 1930–31 Expedition. He is of the same grand type, and I may tell you, incidentally, that he too very nearly lost his life in those kayak-hunting activities, only just escaping by the mercy of Providence. He will tell us of the doings of the last expedition. The travellers were again away over a year and returned in September last. We can imagine what their feelings were after losing their gallant comrade and leader. I leave that episode to Mr. Rymill to describe.

Mr. Rymill then read the paper printed above, and a discussion followed.

The PRESIDENT: We invited Sir Eric Geddes, Chairman of Imperial Airways, to be present; unfortunately he was unable to come, but Commander Galpin, also of Imperial Airways, is here, and we should be glad if he would make a few observations.

Lieut.-Commander B. W. GALPIN: I am afraid I have prepared nothing, and I had not an opportunity of seeing the paper before it was read, so anything I say will be impromptu. First, as representing Imperial Airways—and we are associated to a certain extent with Pan-American Airways, who financed the expedition—I would like to pay a tribute of the very greatest respect to Watkins and the other members who carried on so gallantly after his death.

Whether Greenland is going to be the scene of a Transatlantic route, or one of them, I am not in a position to say, and indeed there is not sufficient information for anybody to be able to decide. As we know, Colonel Lindbergh has recently flown over Greenland, and I think the remark he made as to the result of that flight rather leads one to understand the difficulties that are there. He

said, "there must be no forced landings." Until your aeroplane is so reliable that you can say with absolute surety that there will be no forced landing I think that the Arctic route will be at a disadvantage compared with others.

I should like to ask Mr. Riley about the winds on Lake Fjord, because it seems to me that that lake is rather long and somewhat narrow, and it has mountains on each side. I should like to know whether the wind blows up and down the lake or whether there are any winds that blow across; because if they blow across the lake I do not see any chance of an aeroplane getting off it. The pilot would have to get off across the narrow part of the lake with a very steep mountain to climb or avoid as soon as he was off the water.

Mr. RILEY: The wind is up and down the lake.

Lieut.-Commander GALPIN: That is fortunate. I followed very carefully the reports of the earlier expedition and the adventures they had on the inland ice, and I do not think that this later expedition tells us any more about conditions there. What it does do is to show that there is a lake and a fjord close to it which have possibilities. It seems that there will have to be a tremendous amount more done before there will be sufficient information to warrant actually starting an air service across that country. The difficulties of supply, the difficulties of personnel even to run a mail service, would be very great. If passengers were carried there would be the difficulty of putting them up in a good hotel, which passengers by air generally expect. When you think that the normal method of living in that country is within those somewhat lop-sided triangular tents, you will realize that there is a long way to go.

Professor FRANK DEBENHAM: Those of you who were here two years ago almost to the day—probably a large proportion of those present now—when Gino Watkins gave an account of his main expedition, will remember that after the lecture Sir William Goodenough asked all the members of the expedition to come on to the platform. I particularly remember the largest of them coming on last and trying to get behind some of the smaller ones, and that was our lecturer to-night. I think that incident brought home to us better than before the fact that we were getting a rather different type of expedition to those we had been accustomed to read about, at all events in the north, and that there was a supreme quality in that slim, eager leader at the head of those thirteen men, a quality which would carry him far; and, looking at those men behind him we felt they would follow him as far as he would go. He was, unfortunately, destined not to go very far, but I venture to think—and I hope you will think with me—that his mantle has descended on shoulders fit to wear it.

We have heard to-night the story of a crippled expedition, because when one out of four, and that the leader, disappears it completely cripples the plans. Three is an impossible number really for such a business as polar exploration, and even if the three can keep together it is not a useful number. For when the job is for two of them to go and survey up dangerous glaciers grave risks must be taken; and when one must remain at the base for meteorological observations, it is clear that three is an awkward number, unfavourable for either field or base results. You saw the difficulties those men had in trying to carry out the plans their leader drew up, and I trust you will agree that we can congratulate them thoroughly on doing a wonderful second best.

Finally, may I remind you of one other incident at that meeting two years ago? You may remember that almost the last speaker was Dr. Lauge Koch, a very eminent Dane who knows Greenland and is well qualified to judge of men and how things should be done in such regions. When he spoke he pointed with an appraising finger at Gino Watkins, and pointing another finger, almost a warning finger, at the Society, he said, in words which I should like to paraphrase,

words which I think we may remember to-night with particular reference to Mr. Rymill: "There you have a man of great ability for this kind of work, do not let him go to waste, make use of him."

The PRESIDENT: It remains for me to wind up the discussion. I was much impressed by the point to which Professor Debenham drew attention, namely the extraordinary enterprise of these four young men in taking on such an expedition in such few numbers. Their previous expedition numbered fourteen. On the last expedition they ultimately numbered only three, and they have told us that the cost was £850, which was all they could raise at the time. But even on that they were prepared to undertake that marvellous year's work. In my opinion it was an exceedingly fine effort.

I cannot appraise, as Commander Galpin has, the value of the work they have done from the point of view of Imperial Airways, or the real prospects of the route upon which they have endeavoured to throw light by their expedition. No doubt, as Commander Galpin has said, an immense amount of further investigation is required. They came to the conclusion that it would be possible to establish aerodromes or air ports in Greenland usable even in winter. We can only watch developments and recall the valuable contribution of this party when further light is thrown on that problem.

Professor Debenham has just reminded you of the remarks which Dr. Lauge Koch made in this hall at the conclusion of Gino Watkins' lecture of 1931. We certainly need to make the utmost use of these grand young men, and the country should realize the importance of their services being taken advantage of promptly while we have them available and before they get stale or disheartened by lack of interest on the part of their countrymen.

I would like to touch in passing upon an interesting if trivial phenomenon suggested by one of the slides—the ubiquity of the raven. Strangely enough that bird is one of the very few that have been met with in the heart of the Great Arabian desert. There the raven breeds, and now we learn that it breeds in Greenland! It must have an extraordinary capacity for adapting itself to local conditions.

The hour is now late, and I will only ask you to join me in thanking Mr. Rymill very heartily for his illuminating paper and Mr. Riley and Mr. Spencer Chapman for their interesting contributions relative to their individual shares in the work of the expedition. They have given us an exceedingly interesting evening, and I ask you to join me in expressing hearty thanks to Mr. Rymill and his comrades.

Admiral Sir William Goodenough sends the following note for the discussion:

The two expeditions initiated and organized by Gino Watkins afford an admirable answer to those who still ask "What benefit is to be derived from Polar exploration?" Here was a definite objective: To narrow the surface of the Earth by finding new channels of communication, and to make possible a fuller use of the aeroplane, a vehicle even now only just past its infancy. In the course of such investigation much kindred work has been accomplished. Whether when aeroplanes have become more stable and methods of navigation and pilotage more perfect the Greenland route to Canada will be the one adopted no one can foresee. But whatever happens it is to the pioneer the credit should go: in this instance to Gino Watkins and his companions. Gino Watkins' spirit was present with us at Mr. Rymill's lecture. The spirit of one to whom the word "failure" was unknown, to whom a temporary setback was but an incentive to further effort. The admiration which all have for him and his companions gives us faith and confidence in their future. We look forward eagerly to the formulation and execution of plans for further expeditions which whether north or south may be made by them, for we know that such will have a definite and useful object.

THE SECOND ANTARCTIC COMMISSION OF THE R.R.S. *DISCOVERY II: A paper read at the Evening Meeting of the Society on 5 March 1934, by*

D. DILWYN JOHN

THE work I have to describe is the most recently completed of the *Discovery* Committee's oceanographical researches upon the environment of Southern Blue and Fin whales. The first paper to the Society upon this subject was in 1928, by Mr. A. C. Hardy, who was then Senior Zoologist of the *Discovery* Investigations but is now Professor of Zoology and Oceanography at the University College of Hull (*Geogr. J.*, vol. 72, p. 209). In his description of the work of the years 1925–27 by the Royal Research Ships *Discovery* and *William Scoresby* he discussed oceanography, or the exploration of the sea, in a general way and used a metaphor that I would like to recall. These were his words: "I would liken the exploration of a wide stretch of ocean to the crossing of a continent on a road in the dark and trying to build up an idea of the country traversed from the samples of minerals, plant, and animal life clutched and groped for a little way to right and left when stopping at intervals."

Since that time our work has been continuous: the research vessels have crossed and re-crossed the waters of the Falkland Sector of the Antarctic, stopping at frequent and equal intervals to make similar collections and observations. So many collections and so many observations over a number of seasons have now been made that pictures of the varying conditions, more complete in some ways than in others, are possible.

A picture of life in an ocean depends upon a knowledge of its relationships to its physical basis—the water. Just as on land so in the sea all animal life depends, either directly or indirectly, upon plant life. The floating plant life in the surface oceanic waters derives energy from the sun's rays, oxygen, carbon dioxide, and minerals from solution in the water. In the Antarctic the floating plant life is unusually rich and formed almost exclusively of diatoms. The kind and the wealth of animal life are related to those of plant life, and they in turn to water conditions. It is by a systematic sampling of all three—animals, plants, and water—and by a knowledge of certain other conditions, for example the meteorological, that a picture is to be built up. The movements of water masses, which are themselves due to prevailing winds and density differences, the results of climatic conditions, are modified by the effects of the Earth's rotation, by the shape of land masses, and by the shape of the sea-bottom. Water movements cannot be fully understood if the existence of submarine ridges and shoals are not known. Since the investigations began, since Professor Hardy spoke, oceanography has been armed with a new weapon—the echo-sounding machine.

With the echo-sounding machine it is possible to take a sounding in the deepest water in moderately good weather in four or five minutes or less, and without stopping the ship. By the older method of lowering a wire to the bottom while the ship was stationary a deep sounding took one or two hours or more. The new method has made it possible to take numerous soundings

without stopping the ship at all; we took over nine thousand on the last commission of the *Discovery II*. An equal number taken by means of a lowered wire would have entailed stopping the ship for a total of more than one year.

The primary object of our researches is a thorough knowledge of the environment of Southern Blue and Fin whales, the species upon the capture of which the great Antarctic whaling industry is based. Our work was at first confined, as the industry was, to the Falkland Sector of the Antarctic. The industry was confined to it because it is the nearest to Europe and the only sector to offer, in its islands, the harbours and land bases which were necessary for the first phase of Antarctic whaling—what I shall call the territorial phase. The evolution of pelagic whaling freed the industry from its dependence upon immediate land, and therefore from restriction and taxation, and it grew enormously and spread around three-quarters of the circumference of the Antarctic. The record number of whales killed in one season during the territorial phase was 11,792 in 1915–16, when Government restrictions were relaxed because whale oil became of great importance as a source of glycerine for munitions. So great has been the expansion under pelagic whaling that the number of whales killed in the season 1930–31 was over 40,000. The result was a glutting of the market and the industry set a limit upon itself.

It is partly for the reason that whaling has become pelagic, and spread around the ice-edge of the continent, that I have to tell you to-night not only of the continuation of our work in the Falkland Sector but of its extension around the entire continent. There was the additional reason for this circumpolar work that the Falkland Sector, in which we have done so much, lies in the path of great circumpolar movements and can only be fully understood when they are known.

I come now to the second Antarctic commission of the Royal Research Ship *Discovery II*. We left England on 3 October 1931 and arrived at our port of registry, Port Stanley in the Falkland Islands, on November 4, early in the southern summer. The months of the summer are the months of the whaling season, and our first piece of work was to make, in them, a complete chemical and biological survey of the waters of the Falkland Sector. It was a repetition and an extension of work of a similar nature made in the same waters during each of the six previous seasons—made, during different seasons, by the *Discovery*, the *William Scoresby*, and the *Discovery II*, or two of them working together. The survey is shown on Map 1.

At each of the positions marked on the chart by a black circle the ship was stopped, a sounding was taken, and the series of collections and observations that we know as a "station" was made. This was the procedure. Temperature records and water samples for chemical analysis were obtained from each of the following levels as far as depth permitted: the surface, 10 metres, 20, 30, 40, 50, 60, 80, 100, 150, 200, 300, 400, 600, 800, 1000, 1500, 2000, 2500, 3000, 3500, 4000 and 4500 metres. Collections of the floating animal life in the upper 1000 metres of water were made by a series of vertical hauls with a net which could be closed at any depth; the succession of hauls was as follows: from 1000 up to 750 metres, from 750 to 500 metres, from 500 to 250 metres, from 250 to 100 metres, from 100 to 50 metres, and from 50 metres to the surface. Another haul was made with a smaller and finer net designed for the

capture of diatoms from 100 metres to the surface. When these vertical collections from the stationary ship were all taken, two flights, each of two nets, one small and of fine silk, the other of coarse stramin and larger, were towed obliquely behind the ship as she steamed slowly away. One flight was towed obliquely from 250 to 100 metres, the other from 100 metres to the surface. The larger net of the two in each flight was of a kind especially suitable for capturing the prawn which is whale-food: *Euphausia superba*.

Between all stations soundings were taken every half-hour or oftener; a continuous record of the surface temperature was obtained by a distance thermograph; samples of the surface water were taken for analysis every four hours. The scientific staff at this time consisted of Mr. Marr, Mr. Ommanney, and myself as zoologists, and of Mr. Deacon as hydrologist. In February 1932 Mr. Rayner, zoologist, left the *William Scoresby* at Port Stanley to join us. Thereafter we added to our observations between stations the towing of a new model of Professor Hardy's Continuous Plankton Recorder; it was towed in all for a distance of about 9000 miles. Professor Hardy described the first model of the instrument to this Society in 1928.

We began in the west with a line of stations from the western entrance of the Magellan Straits to the south (see Map 1). It ended when we could go no farther, at the edge of the pack-ice. The remainder of the survey consisted of similar lines of stations in a north-to-south or south-to-north direction. The meridional direction is in this area the best suited for our purpose. It is at right angles to the big water movements of the area. Our purpose is to build up a picture of these movements, to define their limits, and to know their flora and fauna. That is to be done most rapidly for a given current by making section after section across it. The southern limit of each line was the edge of the pack-ice. The northern limit was quite as definite a geographical boundary, although it is in the open sea, and not visible to the eye, and not to be defined in a word.

One might well ask, what can this boundary be, far away in the open sea? It might be supposed that sea-water throughout the oceans mixed readily, that there would be something like an even and gradual transition from the water of minus temperature, poor in salts because of melting ice and falling snow, at the Antarctic ice-edge, to the warm water rich in salts in the tropics. It is not so: there are successive zones from north to south separated by sharp boundaries. Antarctic surface water is very cold, and although it is poor in salts it is heavier than the warmer more saline water of the neighbouring zone to the north, the temperate zone of the southern hemisphere. This temperate zone is called the sub-Antarctic. Now Antarctic surface-water moves for the most part towards the east because of the prevailing westerly winds, but it has a northerly movement too. Where it meets sub-Antarctic water the very different densities of the two do not allow of ready mixing, and the heavier Antarctic water sinks sharply below the lighter sub-Antarctic and continues its flow northwards below it.

This, the line along which the heavy Antarctic surface-water meets the lighter surface-water of the sub-Antarctic and sinks below it, is the boundary in the surface of the open sea that I spoke of. It is called the Antarctic Convergence. It is a physical boundary very easily and precisely detected with a

thermometer by the sharp change in temperature as one passes from one zone to another. It can be detected as easily if not so precisely by a zoologist with a tow-net, because each of the two waters has a distinctive fauna of floating animal life. The zoologist need know only the species of prawns of the genus *Euphausia* to which *Euphausia superba*, whale-food, belongs. They are so numerous in the surface that his net will always catch some. If, in the neighbourhood of the convergence, he takes *Euphausia vallentini* or *Euphausia longirostris* he is in sub-Antarctic water. He will have crossed the convergence and be in the Antarctic when his net brings back *Euphausia frigida* and not *vallentini* nor *longirostris*. But we, whether sailors or scientists, know and will remember the convergence best in another way: as the line to the north of which we felt one day, at the right season, after months in the Antarctic, genial air again and soft rain like English rain in the spring. I can remember a number of those days vividly. It was like passing at one step from winter into spring. In the southernmost lands in the sub-Antarctic, the islands about Cape Horn, the earth smells as earth should smell and as it never does in the Antarctic. It is no doubt the north-easterly course of the convergence between the longitudes of Cape Horn and South Georgia, so that the former is left far to the north and the latter to the south, that accounts for the vast difference in the climates of two islands which are in precisely the same latitude and only 1000 miles apart. The lower slopes of Staten Island are clothed with beech trees with so rich an undergrowth that it is difficult to push through. Darwin compared the richness of the region to that of a tropical forest. South Georgia, the other island, is a true Antarctic land. The snow-line of South Georgia is lower than the tree-line of Tierra del Fuego.

We have shown that the Antarctic Convergence is continuous around the Southern Hemisphere. It runs for the most part in the latitude of about 50° S. (Map 2). In the longitude of Cape Horn it lies much farther to the south than elsewhere. This is because South America has a greater southerly extension than any other land-mass in the hemisphere, and sub-Antarctic water in forcing its way around it pushes the convergence to a high latitude—to over 60° S. In every longitude in the Southern Hemisphere there is a point at which, going southwards, one finds Antarctic conditions to begin: that is the Antarctic Convergence in that longitude. A similar boundary, or convergence, exists between the sub-Antarctic zone and the zone of warmer surface-water to the north of it, the sub-Tropical zone. It is called the sub-Tropical Convergence. Lying in lower latitudes, its course is not continuous like that of the Antarctic Convergence, it is broken by certain of the southern land-masses. There are differences in the waters and the faunas on either side of this convergence similar to those on either side of the Antarctic Convergence.

I have made this long digression to explain what was the northerly limit of our work during the survey of the waters of the Falkland Sector. It was the Antarctic Convergence. To the survey we must now return.

The bases of the first and second and of the third and fourth lines were joined up by frequent stations along the ice-edge which we were following. Whale food was invariably found there. We made a number of radiating lines of stations around South Georgia as in other seasons. Christmas was spent at Grytviken, the harbour with the oldest whaling station, and the seat of the

Plate 1. A peak on Coronation Island, South Orkneys

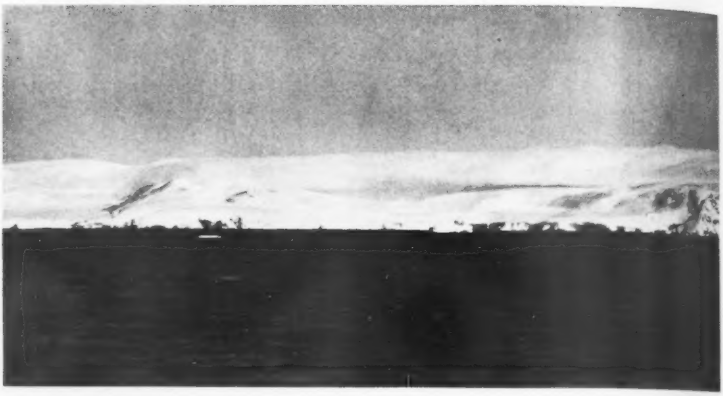


Plate 2. Northern coast of Coronation Island

Plate 3. Northern end of Powell Island from Lewthwaite Strait

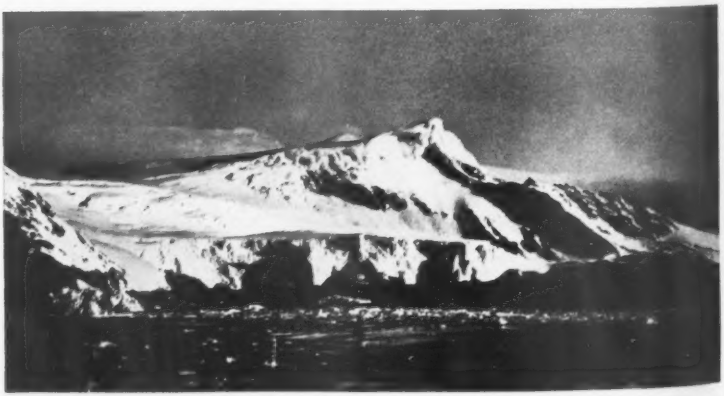


Plate 4. Glacier and peaks near the south-western corner of Coronation Island

administration of the island by servants of the Government of the Falkland Islands.

To complete the survey we meant to make a line of stations as far south into the Weddell Sea as the ice would allow, and we hoped that would be far. It was for this reason: the South Orkney and South Sandwich Islands and the eastern side of South Georgia are bathed by water which flows in a north-easterly direction out of the Weddell Sea. This water, it had been seen in other seasons, was much richer in plant and animal life than that to the west, which came from the Bellingshausen Sea. And yet both waters have much the same temperature and neither is ever deficient in those nutrient salts upon which plant life, and therefore all life, depends. How then does the difference come about? We thought the answer might be found in the history of Weddell Sea water. The origin of the current which flows out is an inflow along the coasts of Antarctica from the east. I have described Antarctic surface water as flowing to the east and north. That is true for the greater part of it falling under the influence of westerly winds. But far south in the Antarctic, south of 66° S., easterly winds prevail and the surface water moves to the west. That is the water which flows into the Weddell Sea, circulates around it, and emerges into the region of westerly winds.

The ideal programme would have been to enter the Weddell Sea far in the south-east with the water entering from the east, and to follow the course of that water to its place of emergence, tracing the changes which take place in it. That would be possible only in an exceptionally open ice year, and then probably only in the month of February or in early March. Weddell alone of those that have entered the sea enjoyed so open a season as that we should have required.

Our line of stations, begun on 10 January 1932, was to the east of the South Sandwich Islands. We met with streams of drift-ice in 58° S., opposite the middle of the South Sandwich group. For six days, for a distance of 700 miles, we steamed through drift-ice to the south till we reached the high latitude of 70° S. Although the floes were sometimes of considerable area they were never very heavy, and there were always ample streams of clear water and leads between them. They were more closely packed, there were fewer clear patches of water and leads at some times than others; but always sufficient to make our passage quite easy. There were light winds from the south; on January 17, as we crossed the Antarctic Circle, there was a definite southerly swell. The season was early. There appeared to us to be every reason to believe that, as it progressed, the ice through which we had come south would become more scattered if it did not blow away and dissolve altogether.

In 70° S., on January 19, we were brought up by a clear-cut wall of impenetrable pack which lay unbroken to the south. No ship could have entered it. It was perhaps 10 to 15 feet in height, its surface a wild maze of rafted and upended floes, pressure ridges, and hummocks. The previous season, on 1 February 1931, the *William Scoresby* found an unbroken ice-edge a little to the east and north of this point. Several floating factories had spent that season fishing along the edges of the Weddell Sea ice between the 60th and 61st parallels and between the longitudes of 20° and 40° W. The Secretary

of the Norwegian Whaling Association tells me that one of them rounded the edge of this ice to the east in late January and found no ice again until she reached 69° S. Another, of which I have still more meagre details, passed through water entirely free of ice to the same latitude, 69° S., before she met ice. It seems probable that the hard ice-edge we saw in 70° S. in 1932 was the same that the *William Scoresby* and two factory ships saw in 1931, *i.e.* that it had remained unbroken over at least one year. Our station at this point, the farthest south we could go, showed that we had at last reached the water flowing into the Weddell Sea from the east. We turned to leave on a north-westerly course to approximate as nearly as possible to the ideal series of observations: a series following the circulation in the Weddell Sea.

During the first three days of our return passage, on the second of which we recrossed the Antarctic Circle, we had no difficulty. The ice varied from drift to loose pack containing a number of old pressured floes; but the temperature fell and young ice, dark in colour, was found in the smaller clear patches and in the leads. We had not seen this kind of ice before. It varied in thickness from 1 to 4 or 6 inches and could have been only a few days old. The night of the third day came with almost ice-free water as far as eye could see to the north and west. But the clear area was small.

Early on the fourth day our passage became difficult and it remained so off and on for the five days which followed, until we were clear of the ice. This was for a distance of about 250 miles. The pack was closer than before, with few and narrow leads and a scattering through it of old heavy floes which gave it greater weight; and all was bound together by the new ice, now anything from 6 inches to 2 feet thick. In places this ice was still dark in colour, in others overlaid with light snow. It was not hard, and there was no sharp jar when the ship came up to it, nor did her stem ride and break it; but she was brought up in surprisingly few feet with little progress to show. No long crack opened up through it like the long cracks through thin floes before the stems of ships in polar films. It was tough with a resistance which was almost glutinous. Since it occupied the leads that we must use, we had to push through it bit by bit for hours on end. It was while doing this that our rudder became damaged. We had gone astern in a clear space, the ship had been stopped but was carrying sternway. The officer of the watch rang for steam ahead, but at that moment the throttle in the engine-room jammed and the engineer could not carry out the order. The ship continued, though very slowly, to go astern and the rudder struck hard ice. It was turned through over 45° by the blow and the rudder shaft was twisted in its trunk and thrown out of its keyway. But the engineers were able to make temporary repairs so that the rudder could again be used, though only through a much smaller arc than previously.

We saw, on one of these days, a striking demonstration of the fact that icebergs and pack-ice are moved by entirely different forces, the former, lying deep in the water, by surface currents, the latter by winds. We were indeed held stationary for a short time by the opposition of these two forces, and we had no alternative but to watch and wait. We were in a narrow lead between two large floes. The wind was on our starboard hand, from the ENE., blowing between 11 and 16 miles an hour. Slowly the floes closed in

and held us and we could not go on. We found this to be due to a large iceberg, 1 mile long and 120 feet high, on our port hand, on the opposite side to the wind. It was being carried towards us by the current, against the wind and through the pack at the rate of about 1^1_2 knots; in doing so it was closing up and "pressuring" the pack in a wide arc before it, and charging through it, leaving a broad wake behind. For a time we were within the advancing arc of pressure, but when the iceberg had passed a short distance astern of us we were able to go on again.

Three days later, the wind still in the east and now strong, we were in a similar narrow lead between two large floes. It closed where the floes met just ahead of us. The ship's bows were brought quietly to the crack. As they entered the ship lurched, partly heeling to the wind, partly perhaps because of the shape of the underwater edges of the floes. As she lurched a rending noise was heard and oil fuel began to escape on the starboard side. The damage was not serious: a small hole had been rent through the plates of an oil-fuel bunker and the forward end of the bilge keel was twisted. We left a broad stain of oil fuel on ice and water.

We left the ice shortly afterwards. Our difficulties had come about because new ice had formed in the leads and clear spaces in high summer and had bound together what would otherwise have been easily navigable pack. We had not expected this. The only other record of such an occurrence that I know of is Biscoe's, off Enderby Land in late January. That we were able to get out, though with minor damage, was due to the fact that we were in a full-powered ship; it might have been very difficult otherwise. The big programme in the Falkland Sector; the long lines of stations far from land which made the circumpolar cruises that I am about to describe; the regularity of the stations because they could be made in a wide range of weather conditions: all these were possible because we were in a ship with the size, the range, and the power of the *Discovery II*.

We continued to make our routine stations during our passage through the ice out of the Weddell Sea. Sometimes the space available between the floes was big enough for our vertical observations but not big enough for us to tow nets behind the ship. Life in this water carrying pack-ice was very different from that of the warmer ice-free water to the north, quite apart from the fact that Antarctic water carrying pack-ice has forms of life peculiar to it which are not found elsewhere. Diatoms were numerous in the ice-free water, colouring it green; they were almost entirely absent from the Weddell Sea. And yet whale food was common; it was seen swimming around the floes at our most southerly station. There were no whales so far into the ice. The only birds were snow-petrels and antarctic petrels and a very small number of solitary Emperor penguins on the floes. Our numerous echo-soundings showed that the part of the Weddell Sea we had covered was remarkably even in depth, about 2500 fathoms.

We went from the Weddell Sea to South Georgia. Temporary repairs to our rudder were made there at a whaling station. We made a line of stations to the Falkland Islands, returned to South Georgia, and sailed for the Cape. At Simonstown the ship was docked and repaired in the month of March 1932.

And now came what was, in many ways, the most interesting feature of the commission, the winter work: a series of cruises to and from the ice-edge east-about from South Africa to South America (Map 2). We had not been in these waters before, nor had we, nor any other ship, made such long cruises to the highest latitudes possible in winter. On each of the cruises a full chemical and biological station of the kind I have already described was made each night. Echo soundings were taken at half-hourly intervals, *i.e.* one for every 4 or 5 miles steamed.

The first of the cruises began from Simonstown on April 8 and was south-east to the ice-edge off Enderby Land and from there to Western Australia. The edge of the ice lay in 65° S., 70 miles from Enderby Land, and that was the nearest that we got to the mainland on any of these cruises. This cruise lasted thirty-one days.

We spent a week at Fremantle. On the next cruise we met the ice-edge in 63° S. some 100 miles from the coast of Banzare Land. We turned and steamed north-east to Melbourne where we stayed one week before again going south to meet the ice. We found it in 61° S., farther north than on either of the two previous occasions, on June 22, midwinter's day, 1932. After spending two days in work along the ice we turned north-east for Auckland, New Zealand, where we arrived on July 4. Each of these two cruises had taken about three weeks.

It was known in New Zealand that we would stay for some time. Nothing could have exceeded the welcome we received. It was not only from our immediate hosts, the people of Auckland: letters of welcome came from societies, institutions, and persons in every part of both islands.

We remained in New Zealand refitting until the end of August. On September 1 we left Wellington to attempt a cruise longer than any yet. On each of the three V-shaped cruises I have just described we crossed and re-crossed both the sub-Tropical and the Antarctic Convergences and so fixed their positions, which were unknown before, in six different longitudes. On each cruise the crossings of the convergences were almost as much the sort of milestones to us that crossing and recrossing the snow-line and the limits of the higher zones of vegetation would be on a long journey across a mountain range. Every one knew when we had crossed a convergence; it was a step farther on.

We wanted to do more in the vast southern ocean south of the Pacific than to cross and recross those convergences once, as on a V-shaped cruise; we wanted the positions of the convergences, and we wanted observations and collections, midway between New Zealand and South America, where a V-shaped cruise would not have taken us. So we set out to make a W-shaped cruise, the two bases of the W to be on the ice-edge, the middle apex a point on the sub-Tropical Convergence south of the mid-Pacific.

We met the ice ten days after leaving Wellington in 62° S. and we turned north-east for the sub-Tropical Convergence. We were very near to it in 41° S., 126° W. The cruise we were attempting was a long one, just within the range of the ship given moderately good conditions; there was little fuel to spare. To have gone farther north to find precisely where the sub-Tropical Convergence lay would have been to prejudice our chance of reaching

the ice a second time, and this we were very anxious to avoid. But we did fail to reach it nevertheless. Soon after we had turned south-east a gale came which blew for five days. Observations were impossible and we made poor distance—at the same time using the usual amount of oil each day. It was the longest gale of the whole commission. When it was over we resumed our stations and carried them to 63° 57′ S., 101° 16′ W., where there was no sign of ice to the southward. There we had to turn; the fuel remaining was not sufficient to go on. We arrived at Magallanes on October 5 and at Port Stanley on the 9th. The cruise from New Zealand had lasted thirty-nine days; it was 7000 miles long.

Crossing the convergences were the steps, the milestones of each cruise. The ice was the goal. It was at the same time something more. Antarctic seas free of ice have little or nothing to recommend them as the scene for one's day of labour. Pack-ice is another matter: it has interest and beauty. We looked forward to each visit and expected, though we did not always get it, sunshine and finer more settled weather than in lower latitudes. On each of our four visits on these circumpolar cruises the ice was found, as might be expected in winter, to be new and young. One example, the ice-edge in mid-winter, south of the sea between Australia and New Zealand, will be enough. We approached the main body through scattered brash. There was a wind and a moderate swell, so that the sea was not still. But there were long lanes of freezing water lying in the direction of the wind, at first far apart and then nearer till we came to a sea entirely covered with a thickening skin of mushy new ice riding the swell. Beyond were small pancake ice and light floes. We pushed some little way through them to tow nets below them for young whale-food. And then we retraced our steps to find that after only a few hours the sea that we had seen covered with a skin of mushy ice was now a mass of closely packed pancakes about 18 inches across and ¾ inch in thickness. So quickly is ice formed. A moderate swell from the ENE. had been running throughout.

Some of us with the experience of several summer seasons elsewhere in the Antarctic had supposed that these winter cruises would be so rigorous as to be extremely unpleasant. It was not altogether so. The conditions were of course harder than those of summer. If there was a gale with heavy seas and spray the ship's decks and bulwarks and upper works became thickly encrusted with ice. Ropes and wires and shrouds became enormous and beautiful. We found difficulty in working our gear on stations at the lowest temperatures. The blocks and sheaves over which ran the wires, lowering the nets and instruments into the sea, became seized up with ice and had to be thawed out with flaming torches of burning waste and paraffin before a station could be started; and often too after each of the pauses which are necessary between the successive observations which make a station. The instrument, known by the misleadingly simple name of a "water-bottle," which is used for getting samples of water from the upper layers, would freeze up in the air before the sample could be taken from it. Any ice formed in the bottle would ruin the sample and the bottle could not be used again until it was thawed out and freed from ice. To overcome this difficulty Mr. Deacon, the hydrologist, pressed the element he was studying into his

service. Throughout the Antarctic a warmer more saline layer of water underlies the very cold poorly saline surface layer (which is about 100 metres in thickness). A simpler instrument was lowered into this comparatively warm deeper layer; allowed to remain there long enough to thaw out so that it was quite certain that it contained no ice; brought up to the level in the cold layer from which a sample was required; and closed when the thermometers had registered the temperature. It was then hauled to the surface, taken quickly off the wire, and rushed to laboratory.

For those responsible for the ship's movements and her safety, Commander Carey and his officers, the long hours of darkness were the most trying feature of the cruises. But they held what, more perhaps than anything else, will make these cruises memorable: the displays of the Aurora Australis which are never seen in the Falkland Sector. Roy Campbell, in his remarkable poem, 'The Flaming Terrapin,' has described what he calls the "wild Antarctic lights":

> "Zigzags of scarlet, combs of silver flame,
> Shivering on the darkness, went and came,
> And fifty hues, in fierce collision hurled,
> Blazed on the hushed amazement of the world."

Those that we saw did not fulfil the full picture that that calls up in my mind: they were not so colourful. There were not fifty hues, but three or four. What we did see were swaying curtain fringes, waving beams and arches, and ragged wreaths of pale green, blue, or white light, all of which brightened rapidly, were never still, and faded quickly. But I think that poetry such as Roy Campbell's, with its speed, does capture something of the wonder of these displays that is lost in a more laborious, if more truthful, prose description.

One cruise remained to complete our circumnavigation of the Antarctic: one in the Atlantic Sector between South America and South Africa. It could not be done until March 1933. It was done then and the turning-point was south of the Antarctic Circle, in 69° 22′ S., 9° 37′ E. We were there on a gloriously sunny day; the depth was only 1513 fathoms so that we were not very far from land, but there was nothing to suggest that it was very near. We have since learned that our position lies 60 miles within the eastern extremity of Crown Princess Martha Land, charted by Captain Halvorsen, as shown in a map published by the *Geographical Review* (vol. 22, no. 1, 1932, Plate 1). This is the fifth occasion on which the Antarctic has been circumnavigated, the first on which the greater part of it was done in winter.

Captain Cook completed the first circumnavigation of the world in high latitudes in 1775, and finally disproved the existence of a large continent in the temperate zone of the south. He made the first discovery of a typical Antarctic land, South Georgia, and shortly afterwards discovered the southernmost of the South Sandwich Islands. The Russian voyage around the Antarctic under Bellingshausen in 1819–21 has been described by Dr. Mill as "a masterly continuation of that of Cook, supplementing it in every particular, competing with it in none." It was for the most part in a considerably higher latitude than Cook's voyage, showing that there was continuous sea south of the 60th parallel. The first land south of the

Plate 5. Southern coast of Coronation Island

Plate 6. Eastern coast of Coronation Island

Antarctic Circle, Peter I Island, in what is now called the Bellingshausen Sea, was discovered.

The two other circumnavigations, though the first was British and the second Norwegian, and although they were separated in time by one hundred years, have this in common: that each was conceived and paid for by a merchant with more than a commercial interest in the Antarctic.

In 1830 John Biscoe left London on a sealing voyage to the Antarctic with a brig and a cutter and instructions from his owners, Messrs. Enderby, to make discoveries in a high latitude. He circumnavigated the Antarctic eastabout from the Falkland Islands, following the ice-edge for a great part of the way, and discovered what is now known as Enderby Land. It was not seen again for a hundred years, and then by Sir Douglas Mawson, in the *Discovery*. The story of Biscoe's voyage is one of wonderful endurance and perseverance in the face of hardship. This Society listened recently to an account of the circumnavigation of the Antarctic by the *Norvegia*, in 1930–31, sent out by Consul Lars Christensen, of Sandefjord, Norway.

Three of the five circumnavigations have been British, one Russian, one Norwegian.

We come now to the second summer season of the commission, that of 1932–33. The first months of it were spent in making a survey of the waters of the Falkland Sector similar to that of the previous season. I do not need to describe it in detail. We had arrived at Port Stanley from New Zealand on October 9; we left again on the 15th, and had completed the survey before Christmas, a month earlier than in 1931–32.

There were big differences in the ice conditions of the two years. The Bransfield Strait had been closed with ice in late November 1931; it was completely ice-free in the first week of November 1932. We entered Deception Harbour and made stations across the Strait. There was heavy pack immediately to the north of the South Orkney Islands in early December 1931; the islands were ice-free in late November 1932. The pack lay 70 miles to the south of them and ran in a north-easterly direction besetting the southernmost of the South Sandwich Islands.

Christmas was again spent in Grytviken, South Georgia.

Our main work, it will be clear from what I have said, is oceanographical. But we take any opportunities which may occur to survey the little-known coasts of the Falkland Dependencies. The South Sandwich Islands were surveyed in 1930 on the first commission of the *Discovery II*, when Dr. Kemp was directing the work in person; in 1931 he addressed this Society on that and other survey work (*Geogr. J.*, vol. 79, p. 168).

On our second commission the month of January 1933 was set aside for survey work provided that the oceanographical programme was completed before. We hoped to do the South Orkney Islands; if that had been impossible we should have gone on to the South Shetlands where some work had been done but where very much remains. The oceanographical work was completed at South Georgia before Christmas; in the course of it we had seen that the South Orkneys were ice-free so early as late November. They are surrounded by ice every winter, open for a longer or shorter period every summer. We

Plate 6. Eastern coast of Coronation Island

left South Georgia on 29 December 1932 and arrived at the South Orkneys on 2 January 1933 in fine weather and a survey of the islands was begun at once. It was of course directed by Commander Carey, and was carried out by Lieut. A. L. Nelson, R.N.R., then Chief Officer and Navigator, now Master of the *Discovery II*.

The group is composed of two big islands, Coronation and Laurie, the former of which is about 30 miles long by 10 miles broad; two smaller islands, Powell and Signy; and a larger number of very small islands and rocks.

The islands were discovered in early December 1821 by the Englishman Captain George Powell, in the sloop *Dove*. He landed, took possession, and made a survey. He was accompanied by the American Captain N. B. Palmer, in the *James Monroe*, with whom he had sailed east from the South Shetlands in search of seal. Nine weeks later they were visited by James Weddell, who came again the following season, still unaware of Powell's discovery and work, and examined them thoroughly for seal, finding few; he made a survey of the group and left to make his remarkable journey, to a higher latitude than any ever attained before, in the sea that is now named after him.

The islands were visited again in 1838 by the Frenchman Dumont D'Urville, who did some survey work along the northern coasts. Charts based on the early work of Powell and Weddell, modified by that of D'Urville, remained the only ones of the islands until early in this century. Then, when the Scottish National Antarctic Expedition in the *Scotia* wintered in the group in 1903, Dr. Bruce made an accurate and detailed survey of Laurie Island which replaced D'Urville's on the charts. The meteorological station established on Laurie Island by Dr. Bruce was taken over by the Argentine Government and is maintained to the present day. In 1912 the Norwegian whaler, Captain P. Sörlle, made extremely useful surveys of the coasts and harbours of the western islands, Coronation, Signy, and Powell. They could not however be accepted as complete or final.

A complete survey of the islands, other than Laurie Island, was made between January 2 and January 30. Numerous inshore soundings were taken with the echo-sounding machines. Whenever we were steaming around the islands—and for the purposes of survey we steamed slowly—we sounded every two or three minutes. We entered all the bays and sounded them. The harbours were sounded in all directions by boats so that detailed plans of them will be possible. The new charts have not yet been published by the Admiralty. We took every opportunity of making large collections of the rocks, plants, and animals ashore. The points at which we collected extended from the Inaccessible Islands in the west (on which there can be no doubt we made the first landing, since no one would land there but to collect) to Laurie Island in the east. The collections have not yet been reported upon by specialists. Mr. Marr is preparing a full report upon the group.

The larger islands are heavily glaciated and deeply covered with snow. Coronation Island rises to over 3000 feet. Much of its glaciation is of Highland Ice, such as is found in Spitsbergen, showing the shape of the underlying land. Where this is so and the land rises gently from the sea, as on the western end of the northern side, the coast is made up of a series of unbroken stretches of ice-cliff (Plate 2). Parts of the southern coasts are of

a much grander type: there are bold rock buttresses, ice-encrusted rocks, ice-falls, hanging glaciers and "ice-foot glaciers" (Plate 5). The eastern coast is of another kind, having hills, and small valleys occupied by glaciers (Plate 6). Coronation Island has the biggest glaciers of the group but none of them is very big, and all are too heavily crevassed to stand the strain of being pushed out to sea and being water borne; most of them end on the land (Plate 4). The faces break away in small pieces making brash and growlers common around the islands (Plate 8). Laurie Island has a deeply indented coast-line and a more rugged topography than Coronation Island.

Powell Island, high and steep, is heavily and almost completely ice clad. It has comparatively few bare patches of rock and none of earth (Plate 3). Signy Island is lower and only a part of it is glaciated. There are big patches of bare rock, of screes and earth. The steeper of the smaller islands are free of snow in summer except perhaps for small patches near their highest points.

On the southern and south-western faces, the windward faces, of the peaks at the south-western corner of Coronation Island, great irregular masses of ice of a porous structure stood out to windward (Plate 4). Although we climbed to, and touched and saw, them, the mists came down and no close-up photograph was possible. I have since learned that the formation is known as rime; and that it is formed during high winds in the mountains by drops of mist, which have remained liquid at a point below the usual freezing-point, solidifying out or freezing one on top of another when they strike an obstacle such as a rock-face or the summit of a mountain already covered with snow. This can happen too, again in high winds, when the moisture in the air is not in droplets forming mist, *i.e.* when the air is clear; the formation is then known as hoar-frost. It seems that the formation of rime and hoar-frost are of widespread occurrence and well known to those acquainted with mountain phenomena; they occur, for example, on Ben Nevis. I have mentioned them because I feel sure they are not well-known to those without such special knowledge.

We anchored at the dinner hour one night at the point from which the photograph (Plate 4) was taken, and Deacon and I set off afterwards to reach the peak. The going was extremely heavy on the left side of the glacier, and we had to change around to take turns at leading very frequently. The enormous unbridged crevasses, as much as 30 feet across, forced us to make our way through the chaos of the ice-fall on the right below where the thick ice-field spills over a vertical rock wall. The upper part of the fall consists of pieces of ice some as big as churches, others the size of cottages, lying at all sorts of angles to one another. We were there in the soft half-light of early night, and fortunately of one of the very few nights when there had been a coloured sunset. Much of the colour remained in the sky and was caught by the snows of the glacier sloping to the west. Although the peak is that of an inconsiderable hill we did not reach it that night. There was a number of us keen to climb, but our opportunities were limited, of the sort I have described.

The South Orkneys lie directly in the path of the Weddell Sea current flowing to the north-east, and grounded icebergs, the smaller inshore the bigger farther out, are very numerous off their southern shores. At least 1500 were present at the beginning of the month, but many had broken down

by the end of it; we heard and saw it happen to some. We counted 490 grounded bergs from the southernmost peak of Powell Island (Plate 7). Their size may be guessed at by that of the ship, nearer than any of the bergs, over the right shoulder of the figure on the left. Steaming inshore they were sometimes so thick as to cut out the southern horizon.

Seals appear never to have been numerous on the South Orkneys. We saw Weddell seals, sea elephants, and sea leopards, but not in very large numbers. Fur seals once occurred. Birds, on the other hand, are extremely numerous. The most numerous penguins are Adelie and Ringed penguins. After steaming around all the coasts of the group one is almost forced to conclude that the limiting factor to the number of penguins is the number of sites available for their rookeries. They occupy all the obvious places, and in addition they scramble up steep smooth rocks out of the sea to reach the smallest of bare patches, even to some distance up steep snow slopes.

When this month of survey, a very pleasant interlude, was over we turned again to oceanographical work. We made a line of stations to the Bransfield Strait; repeated in the Strait the survey we had made there in November; made a line of stations from the South Shetlands to the Falkland Islands; and another from the Falkland Islands to South Georgia and repeated earlier observations around that island. This is the skeleton of a second survey of the area in one season. And then, in March 1933, we made the V-shaped cruise from South Georgia to the ice-edge south of the Circle in 9° E., to the Cape, which I have already mentioned. Observations were continued up the deep basins of the East Atlantic to the equator.

The very end of what had been for us a happy and successful commission was marked by tragedy. In the Bay of Biscay, within two days of England, the captain, Commander W. M. Carey, was lost overboard. He had commanded the *Discovery II* on her first commission. During his four years of service he had come to have a very strong interest in the meteorological and pack-ice conditions in the Antarctic and had devoted much time and study to them. The success and good fellowship of the commission were due more to him than to any one else. We lost, in him, one with whom we were glad to sail.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: Many of you, I dare say, saw the geographical film last week, when Mr. George Rayner, also of the *Discovery II* and formerly of the *William Scoresby*, gave a very interesting film illustrating life on the *Scoresby* and the *Discovery* in one of those Commissions. He gave you the daily life-history; now Mr. Dilwyn John is going to read us a paper on the scientific work carried out in various directions during the Second Commission of *Discovery II*.

Discovery I was Captain Scott's *Discovery* and was used for two seasons; then a powerful new craft was built, *Discovery II*, specially designed for the work which she has to do in the Antarctic. *Discovery II* is the vessel of the organization associated with the Administration of the Falkland Islands which carries on research work on the oceanography and biology of the Antarctic Sea, not primarily in connection with whaling, though at present its work is particularly

Plate 7. Grounded icebergs from the southernmost peak of Powell Island

Plate 8. Glacier face, Gibbon Bay, Coronation Island

Plate 9. The southernmost peak of Powell Island

helpful to the interests of the whaling industry. The chief centre of that industry nowadays is in those seas; in fact, two-thirds of the world's output of whale-oil is from the Antarctic. We meet there with competition from the Norwegians and from the Argentine, and so need to do everything we possibly can in the way of research and activity to show that we are really playing our part in the advancement of economic knowledge and scientific research in that region. I now ask Mr. Dilwyn John to read his paper from which you will realize how effectively we are carrying out our mission.

Mr. John then read the paper printed above, and a discussion followed.

The PRESIDENT: Dr. Stanley Kemp, to whom the lecturer referred as being on the First Commission of the *Discovery II* and who addressed the Society on the work in 1931, is here, I am glad to say. I hope he will come up and address us. Dr. Stanley Kemp is a distinguished biologist and Fellow of the Royal Society. He has spent many years in India latterly as head of the Zoological Survey, and has since 1924 been associated with the *Discovery* Committee, on which body he is now Director of Research.

Dr. STANLEY KEMP: I think you will all agree that Mr. Dilwyn John is to be congratulated both on the success of this remarkable voyage and on the very admirable account of it which he has given us to-night.

The work on which the *Discovery II* is mainly engaged may be described briefly as the study of the productivity of Antarctic waters, and we now know that in potentiality, if not indeed in actual fact, these very cold southern seas are the richest in the world.

In the close interrelations which exist between animals and plants and the chemistry and movements of sea-water, the whole system may be likened to an extremely complex machine: it is the way in which this machine works, and the great seasonal changes in its operation, that we are seeking to understand. Knowledge of this kind, to be obtained only by the slow accumulation of data and material and its subsequent treatment in the laboratory, is not merely of scientific interest; it is fundamental to the solution of almost all economic problems in marine biology, including those of whales.

In the course of this splendid circumpolar voyage Mr. Dilwyn John and his colleagues have obtained great wealth of information, and as we proceed day by day in the analysis of results we realize more and more how important it has been.

On Mr. John, as leader, a voyage such as this must have made great demands. To carry out these long series of observations with the scrupulous accuracy that is required needs not only scientific knowledge but great enthusiasm, the ability to inspire others with perseverance and determination in a job whose monotony quickly becomes apparent, the capacity for "sticking it out" in all the varied sorts of unpleasantness that are to be found in the Southern Ocean. Mr. John —and the same is true of Commander Carey, whose loss we so much deplore— has proved himself ideally suited to this difficult work. I congratulate him most heartily on the very great success he has achieved.

The PRESIDENT: Mr. Maurice, of the Ministry of Agriculture and Fisheries, also a member of the *Discovery* Committee, is with us. We shall be glad if he will comment on the paper.

Mr. H. G. MAURICE: When the President warned me unexpectedly this evening that he might call upon me, the natural question for me to ask myself was why; and I came to the conclusion that perhaps his reason was that I, who have not taken any part in work of this kind but have been in the position of simply directing, not as Dr. Kemp directs, as an expert, but as one who says "Go

Plate 9. The southernmost peak of Powell Island

and do that" and he doeth it—as one telling other people to go and do some work—ought to be called to account. As representing the Department of Agriculture and Fisheries on the *Discovery* Committee, I have taken a certain part in giving instructions from time to time to those who have been doing hard work in those very inhospitable regions to which Mr. Dilwyn John has introduced us; and I thought that perhaps you wanted me to admit, sir, that the *Discovery* Committee, who sit comfortably in the Colonial Office and send instructions to those who are working in the Antarctic seas, ought to come here and see not merely the sunshine pictures which Mr. Dilwyn John has shown of those few days out of so many years when the sun shone, but also those detailed charts with little dots up and down red lines which represent work which he and his fellows have done in the most abominable seas in the world, patiently, monotonously, but inspired all the time with zeal to reach the truth.

Perhaps I can as a layman say a word to you which is worth saying, and that is this: I am associated with a different kind of research, although in nearly every essential respect very similar, that is fishery research, in which my department is continuously engaged, in conjunction with nearly every fishing nation in Europe through an organization which is called by the rather lengthy but comprehensive title of The International Council for the Exploration of the Sea. Our business is to discover all we can about fishes, and we find that some people are very impatient with our research work. We are severely criticized, particularly by people who want to have everything converted into terms of pounds, shillings, and pence, and that in the quickest possible time, because we do not discover things in a week or fortnight or even in two or three years. The hardest task we have is to convince people that scientific research must be slow and laborious, and particularly so when you are working in the sea. For here you have got not merely to work out what is the life-history of this or that fish, which sounds perfectly easy; you have to go to the very fundamentals. You have to follow, from its basis in the sea-salts, the whole chain of life in the sea which begins with the minute plankton, diatoms, and other microscopic plant-life of sea, and proceeds to the animals that feed upon it, themselves to be eaten in turn, and so on, right up, in our case, to the food fishes, and, in Mr. John's case, to the whale.

Mr. Dilwyn John referred to Mr. Hardy's metaphor of a man motoring along a dark road taking samples of what he could grab from either side. A very similar and perhaps more expressive metaphor was used by a predecessor of mine in office to describe our research work in the sea. He said: "Imagine that you are in an aeroplane moving slowly through a dense fog and letting down from time to time some kind of instrument by which you take samples of the plant life and animal life on the land, and imagine what it would be to have to investigate the life on land by such sampling methods as those, groping through dense fog." That is what people like Dr. Kemp and Mr. Dilwyn John, and all our staff who are doing research work, have got to do when they are trying to find out what is going on in the sea. You cannot go down into the sea, especially in those waters there, because you could not live more than a few minutes; you cannot go down and see what is going on as on land. For instance, if you want to do agricultural research you can work in the field and arrange things for yourself. But in the sea you have to grope and find out what you can by taking samples, be certain that your samples are fair samples of what is to be found, and then make reasonable inductions from those samples by statistical methods without any prejudice or bias which may lead you off the path of truth. To maintain that kind of spirit in those seas and to work faithfully in those inhospitable regions, as Mr. Dilwyn John and those who have gone before him have done, is, in my opinion, one of

the finest achievements in the world, because there is no glory about it; no spectacular dash to the South Pole, no planting of flags or anything of that description. It is simply solid hard work to try and find out something which we hope will, in the end, be useful and lead up to what is, from my point of view, the primary goal of these investigations, the rational control of the exploitation of whales, so that we may use the stock to the best advantage and not destroy it greedily and stupidly.

The PRESIDENT: Dr. Mill, would you address us? Dr. Mill, as you know, is our great authority on the Antarctic. He is the author of the 'Antarctic Manual' and other works connected therewith.

Dr. H. R. MILL: I am glad to have this opportunity of expressing what I am sure you all feel, the great pleasure we have felt in listening to this paper. And I feel that I have a right to express your views in this respect because I am sure that I have enjoyed this paper more than any of the rest of us.

I have been engaged in research on oceanography and in the study of the works of others for more than fifty years, and for more than forty years I have advanced Antarctic exploration by the convenient method of encouraging others to go and do the work. During the whole of that time I have been in the habit of applying very critical standards to the accounts rendered by the explorers and the investigators who have returned from the Antarctic, and in that spirit I have listened to the paper to-night. And I have been unable to detect anything in it that I could imagine to have been better done. Mr. John described his work modestly and without sensationalism, but his address was full of that high spirit of enthusiasm which alone can enable a man to carry out such continuous and laborious observations in the most depressing conditions that can be imagined. The expression of poetic feeling we have heard shows that there is inspiration in the study of nature, even when one has to grope for it at the bottom of the ocean, far out of sight, and then piece together the fragments of a puzzle that is only gradually beginning to reveal its true meaning.

I have to congratulate Mr. John and also the *Discovery* Committee very heartily on the admirable way in which they have organized this research. They have kept the British flag flying in Antarctic waters where we were the pioneers and where it is sometimes thought we have been slow to take advantage of the opportunities we ourselves created.

The PRESIDENT: Our speakers have been so eloquent that they have left very little for me to say, and you will agree with me that we have had a most inspiring lecture and a very varied repast. Mr. John gave the scientific part of his paper very lucidly and simply so that I hope we have all been able to assimilate the main features of the system of work which is being carried on by the *Discovery* in the Antarctic. The pictures which he showed towards the end were beautiful specimens of photography and added greatly to the charm of his lecture. We can only hope the *Discovery* Committee will go on with its invaluable work unhampered by want of funds. The service certainly will not lack volunteers when they have got such men as Mr. Dilwyn John, who, as Dr. Mill said, are ever found ready to take on the exacting burden involved and, with the same enthusiasm as he displays, to spend years of, one may say, the most valuable part of their lives, when they are at their best, on such laborious work.

I cannot close without a brief reference to the tragic death of Commander Carey, of which the lecturer told us. I am sure we would like to offer to his party and the Committee our sympathy in the loss of such a valuable navigator and splendid officer for the command of a ship.

I ask you now to join me in heartily thanking Mr. Dilwyn John for his lecture.

Mr. J. M. Wordie sends the following note for contribution to the discussion:

Mr. John has mentioned an extremely interesting feature in the Weddell Sea pack-ice, namely the line of heavy and apparently impenetrable pack which was encountered in 70° S. Mr. John compares the ice which he saw in 1932 with a similar obstruction seen by the *William Scoresby* and two factory ships in much the same locality in the previous year, and ventures the opinion that the heavy ice in these two years was the same and had remained unbroken for at least one year. That the two obstructions were identical is however improbable, for the Weddell Sea pack is continually on the move, as is shown by the drifts first of the *Deutschland* in 1912 and then of the *Endurance* in 1915; it seems hardly possible therefore for the adjacent ice lying farther east to remain fixed; and it seems much more likely that it will also move into and round the Weddell Sea. An alternative explanation would be that an area of heavy land-fast ice breaks away every season from the coast and reaches this particular locality about the same time each year.

In this connection the conditions seen on the voyage of the *Endurance* in January 1915 are curiously similar; Shackleton's ship, after a lengthy and difficult passage through the pack from 57° S., came up against a great wall of hummocked ice on January 2 in 69° 49′ S. (noon position). There was no way through, and the ship's course was altered south-west along the northern edge till the 7th. Since no opening had as yet been found over a distance of 80–90 miles, the ship was then put about, and sailed and steamed north-eastwards back on her course. On January 9, at noon, she was in 69° 47′ S., and had just rounded the belt of heavy ice at its north-eastern end and was at last in open sea. The latitude was approximately the same as a week earlier, but the longitude on the 9th was 16° 49′ W. as compared with 15° 42′ W. on the 2nd. It was evident therefore that in 1915 the line of heavy pack, in every way comparable to that seen by Mr. John, was not held fast, and had moved westwards over 20 miles in seven days. The conclusion which Shackleton's party formed at the time was that somewhere to the east there must lie a deep embayment bounded either by land or by a large ice tongue, such as Termination Ice Tongue, which would act in the same way as a north–south running coast in checking the normal westerly motion of the pack and in giving rise to high-pressure ice.

Mr. John's discovery of a similar obstruction in the same locality in 1932, and the experience of other ships in 1931 give added emphasis to the conclusions reached in 1915. I have little doubt of the existence of a considerable projection somewhere in the east; and of the two possibilities, land or ice tongue, I favour the latter, as in our own case, in January 1915, we also saw great fleets of bergs, as many as five hundred in one day and many of them of solid blue ice, such as would originate in a great ice tongue.

A CAMEL JOURNEY FROM TUGURT TO KANO

NORMAN PEARN AND WILLIAM DONKIN

IT is not without hesitation that such travellers as ourselves venture to offer this paper to those who read the *Geographical Journal* and are therefore accustomed to the records of experienced explorers. We propose however to give a simple account of our journey, without claiming to have made any important discovery, or to have added to geographical and scientific knowledge.

The previous winter we had proceeded from Tugurt to Warqla and El Golea, returning by way of Ghardaia and Laghwat. As far as Warqla the route now taken was the same, and it gave us an opportunity of observing the striking contrast between the winter and summer aspects of a particular part of the desert. The caravan that left Tugurt for the first stage on 11 May 1932 was extremely modest, consisting of but four camels, two being for riding, the third and fourth for our baggage. No one accompanied us except Mohamed ben Shahib ben Seighir, a reliable Chaamba guide who had conducted us on the previous trek. The route from Tugurt to Warqla is tolerably well known, and is doubtless familiar to some members of this Society. Compared to the districts farther south it has much beauty and is well supplied with vegetation, affording ample pasturage for camels. We saw several swarms of hoppers, the locusts of future seasons, moving slowly eastwards across these plains. We could only infer that a breeding territory was somewhere within this area. The mio-pliocene debris which covers the region may well provide suitable conditions for the development of locusts, owing to the prevalence of ample vegetation.

We paid off the guide at Warqla, as this was the limit to which his knowledge extended. We were delayed here, and this gave us an opportunity of witnessing a fantastic display in honour of some local Marabut, whose tomb was to be found some miles outside the oasis. The chief cause of the delay was the difficulty of obtaining permission to take the route we proposed, *via* Fort Flatters, which would necessitate traversing the Great Eastern Erg. On this Erg during the previous summer a caravan of forty Arabs had perished from thirst. Our passage was strongly discouraged by the authorities at Warqla, but eventually we were permitted to attach ourselves to a military convoy that was obliged to proceed in that direction. Two days' journeying brought us to the Mjeira valley on the northern edge of the Erg, where there was then good pasturage. Here we found an encampment of Chaamba nomads, and we pitched our tent at a respectable distance from them. Kuider, the convoy guide, discovered a relative among the nomads, and fraternization took place, leading to an exchange of camels, as two of ours were suffering from swollen pads. Whilst in the valley, the convoy was urgently recalled by two maharists, and we were given written permission to proceed to Fort Flatters accompanied only by two guides and a boy. We were warned by the nomads that the well at El Gassi might be dry, but as it was only three days distant, we decided to push on. We were relieved to find that the rumours were unfounded, there being abundance of water in the well. From Wadi Mjeira to the Hasi el Gassi, the ground is rocky and vegetation very sparse. The water at El Gassi is at a

Messrs. Pearn and Donkin's route from Tugurt to Kano

depth of about 80 feet, and is slightly salted. There is no equipment provided for raising, such as we had found farther north. The camels were driven by the boy to pasturage some 5 miles away, as in the region of the well itself there is no vegetation at all. The tarantula spider seems however to be able to maintain itself, one specimen appearing on Donkin's neck. In the morning the camels were filled to their utmost capacity, the water being baled down their throats till they could hold no more. With fourteen *gerbah* of water for ourselves we set out for the Hasi Tanezruft, distant by six days' hard journeying over the entirely waterless region of the great Erg, which is but scantily supplied, in this part, with pasturage. This, and our later experiences in the region of Aïr were the most exhausting parts of the course, the heat at times being very intense.

On either side of us, separated by some 8 miles, were the lines of the dunes of the great Erg. We were now following the bed of the great corridor, called the Gassi Tawil. As we understood that six days under such conditions of heat was the limit to which a camel could go without water, every moment was precious, even if the journey could be accomplished without mishap, so we travelled for as many out of the twenty-four hours of the day as was possible. Each of these days we moved for twelve to sixteen hours without a halt. Under pressing circumstances a nomad and his camel can travel for four consecutive days without a single halt. For us this was fortunately not necessary, although we travelled much at night, which agreed well with our spirits. Rest was mostly taken by day, although we could not extend the midday siesta very greatly, since the heat and lack of sufficient food were telling on the camels.

Generally speaking the air was calm, or stirred by a soft breeze. From time to time this would suddenly develop into a hot gale, filling the air with particles of sand. Such storms would die down as suddenly as they had arisen, and the drowsy breeze reassert its influence. The last day of this stage from El Gassi to Tanezruft was temperate under a clouded sky. Clouds are fairly common in the Sahara during the summer, and they frequently enable one to anticipate windy weather. They are almost invariably of the alto-cumulus type, though found only at a great altitude. Cirrus formations seem to predominate in winter, their presence greatly improving the beauty of the sunsets during that season.

Our camels had fared badly, from shortage of food as well as from lack of water, and they were now small in the hump, with their ribs protruding. By the end of the fifth day they showed every sign of exhaustion and knelt repeatedly. Thanks however to the familiar device of administering a small quantity of water through the nostril they were stimulated into activity, and bore us to the well at the appointed time. We were thankful to think that we should get a change from the warm, tar-tainted water from the *gerbah*, but the water at the Hasi Tanezruft, though cool and refreshing, tastes strongly of sulphur. That evening a nomad from an encampment some 3 miles to the south told us of a well which he was using where the water was more palatable. The following morning we moved over to this well, which bears the same name as the other, although not shown on the map.

We arrived at Fort Flatters on June 7, and were held up for several days owing to the difficulty of finding a guide to take us into the beginning of the

Tuareg country. Fort Flatters looks northwards across a sandy valley some 10 miles wide, on the edge of which rises the limestone cliff of the strip of *hammada* to the south of the Great Eastern Erg. Less than a mile to the south of this desolate fortress lie the dunes which mark the beginning of the primary rocks. It is interesting to see an identically similar racial and geological boundary. Pasturage is poor in the region of the fortress, and while we were there, locusts, finding nothing to satisfy their prodigious appetites, used to bite our flesh in the night.

We set out from Flatters on June 13 with an increased caravan. Besides ourselves there was Ferreg—a Tarqui from Ghadames, with his fourteen-year-old son, Beeten; Maatallah, an Arab, and Mohammed—another Arab, who acted as camel driver. We now had six camels, four male, one female, and one baby. From Fort Flatters the first point of interest was Assidi Moussa, a fertile little oasis some miles from the fort, in striking contrast with the complete barrenness of the surrounding desert. Unfortunately the locusts were already making havoc of the crops. Leaving Assidi Moussa we crossed the sand-dunes to the south-west, and after traversing a wide gravel plain we reached the Hasi Ta-n-Elak. This is a mere water-hole surrounded by a species of bulrush and a procumbent, though living, palm tree. The water here is very sulphurous, and can be smelled from many yards away. Behind the well there rises a steep mountain flank much broken by large boulders. A remarkable phenomenon of this well is the peculiar humming note emitted from the ridge of the mountain, which makes a sound much like an air squadron passing overhead. We supposed that the sound was due to vibration caused by the wind; and have since been most interested to read Mr. St.John Philby's article in the January 1933 issue of the Society's *Journal* (p. 15) bearing on the same subject.

The route now lay through the steep pass of Jebel Ta-n-Bkak, to negotiate which it was necessary to drag the camels forward by main force. The views of the valley and the Tanezruft beyond were magnificent. Once through the pass we found ourselves on sand slopes piled at such steep gradients as to appear impassable, but by zigzagging the camels we managed the ascent. It was nearly dark when we reached the top, and we carried on over the level sandy top of the tableland by moonlight, with the curious effect at first of a double shadow, one thrown from the west by the dull yellow glow, and the other from the east by the rising moon.

On July 19 we reached the well of I-n-Kelemet and found it very cool and fresh under the acacia trees. We were discovered by various Tuareg, who did us the honour of inviting themselves to partake of our tea, after which they took us over to their encampment, some 10 kilometres away, to meet the patriarch, where we were again allowed to refresh the company. Our main object in interviewing the chief was defeated, for we tried in vain to persuade him to exchange a sick camel, instead of which, in the end, one of his followers induced us to buy a skinny ram. Before we left, the caid assured us that his sole purpose in refusing our request was to enable us to make a more favourable exchange at Amghid, where there were very much better camels to be had. According to custom—as he himself had left early for Fort Flatters—his nobles accompanied us part of the way, with every mark of friendship and respect. It had been the intention to keep the ram for a long time, but it became so

restless that Ferreg and Maatallah, who shared in the purchase, suggested killing it immediately. We left them to carry out the unpleasant Muslim rites, and went on ahead, and halted at some pasturage. We amused ourselves by trying to catch some fennec, which are often used as pets by Arab and Tuareg children. After one meal off the ram the carcase began to putrefy, although neither Tuareg nor Arabs appear to mind eating green, rotten meat. Later Maatallah shot a gazelle near two water-holes in a remarkably deep gorge. We proceeded through numerous boulder-strewn valleys to the beautiful well of 'Ain Tururt, reaching Amghid on June 23. Here there is a landing-ground for aeroplanes and a store of petrol for both aircraft and motor traffic. Neither aviation nor motor transport are continued during the summer months owing to the heat.

We were delayed unnecessarily at Amghid by the obstinacy and unreasonableness of the old caid, who despite the promise of the patriarch at In Kelemet took advantage of our situation and demanded extortionate prices for provisions and for camel hire, and for the proffered services of his own son, Howat, as guide. On the morning of our departure, two days later, one of the hired camels came hobbling on three legs; the fourth showed an ominous swelling. This was treated seriously by the caid, and a stranger of some importance who had arrived the previous day diagnosed poisoning—whether by snake-bite or tarantula or scorpion he did not suggest. Evidently he was impressed by the signs of terror shown by the other beasts. The caid being quite at a loss, and the general confusion so great, the stranger took command. He decided to operate immediately. Fires were set going, and two youths were put to heat the instruments—four large knives similar in shape to a billhook. The camel was placed on its side, the injured foreleg being secured by a rope, on to which three men strained tug-of-war fashion, the other foreleg being folded under the animal to prevent it kicking. A fourth man sat on the hind quarters, a fifth and a sixth exercised a certain amount of control over the rear legs with ropes, while a seventh had the unenviable task of holding the loose lips. Three burns, each about 18 inches long, were drawn down the fore part of the leg. Two or three short brands, 6 or 7 inches long, were drawn at right angles over the knee joint. The work was finished by gently drawing an Arab's knife along the brands. The men then stood aside and the camel jerked itself on to its feet, stamped vigorously with the leg that had been the cause of all the trouble, looked around disdainfully, and walked away with a slight limp.

From Hasi el Gassi we had made almost due south, but at the 29th parallel we had turned south-east for Fort Flatters. Thence with slight deviations we had proceeded south-west to Amghid. From Amghid we continued south to the 26th parallel, bearing slightly to the east, but recovering the southerly direction when we cut across the Wadi Irharhar, near the peak of the Garet el Jenoun (or peak of the nature spirits).

Some 15 kilometres out of Amghid we reached the Hasi ain Laquarrara, where a spring of excellent water trickles from a gigantic pile of rock under the Ahellakane. This latter mountain is an outstanding landmark for more than 50 miles to the south, since it dives in a very fine manner into the Wadi Irharhar. These mountains on the northern border of the Ahaggar massif are much desiccated and buried in their own debris, though their colouring is very fine.

On the night of June 26 we slept at An Adjedda, and eventually reached the Hasi Timeraine, in a well-pastured open valley, where many hundreds of camels were being reared by some Tuareg and their liberated black slaves. Many of the animals appeared to be suffering from some disease, and had their eyes closed, the young generally being in a worse condition than the older beasts. It was said to be due to eating poisonous pasturage.

Afternoon on June 27 found us *en route* for the Hasi Telachint. Our map proved most misleading, the inaccuracies being serious. At Tareskassent our interest was aroused by certain hieroglyphic inscriptions on the rocks, in Tamachec characters, which we thought might have some connection with the ancient civilization revealed by the rock drawings on the Fezzan rocks in Italian Tripolitania; but we were told that these were modern. We saw two eagles here at fairly close range, many gazelle, a snake some 8 feet long and about 2 inches thick, which was charming two pretty black-and-white birds. We obtained water by digging, and put a cloth to serve as a basin for the camels to drink from. Howat bled the beasts at the nose since they were overheated.

At midday on June 30 we came parallel with the imposing peak of Garet el Jenoun, probably volcanic, which rises to more than 9000 feet. The same day we met a wrinkled old woman tending some goats under the precipices of the peak, and also some travellers from Ideles. We discovered a well, not very plentifully supplied with water, that was not on our map, the name being Ti-n-Eker, but the water had been polluted by wild ass. The mountain scenery here is particularly fine. On July 2 we were at an altitude of between 3000 and 4000 feet, and we reached a well in a gorge called approximately Ajedal-ma-Aghagam, which was not indicated on our map; the water was excellent and there were several small trees round the pool. It is in pools of this nature that such species as the Clarias Lazera and the dwarf crocodile may occasionally be discovered, existing as living relics of the Quaternary era, when the Irharhar was a running river. We met a Tuareg woman with a salted goat on her shoulder; her daughter was with her, who made much of Howat, to his mingled embarrassment and pleasure. We met their men folk later on, and on the following day, July 3, we came across a caravan of nine men and eighteen camels coming from Ideles, and we pitched our tent with them in the Wadi Irharhar. On the following day we entered a branch of the wadi that takes its name from the oasis of Ideles, and we found ourselves among rushes, date palms, bright green fig trees, and tall reeds. The size of the latter, for they were about 20 feet tall, frightened the camels. To obtain water it was but necessary to scrape the sand, where it lay fresh and cool and delightfully tasteless. But, despite the richness of the vegetation camel food was lacking, so we had to take the first favourable opportunity that presented itself of climbing out of the valley and continuing along the windy top.

The valleys of the Ahaggar have never offered sufficient pasturage for the Tuareg camels, and for this reason the outskirts of the Ahnet, Azguer, Mouydir, and Ifoghas plateaux have always been used by them for pasturage purposes. When the French captured In Salah they were in possession of one of the key oases of the Tuareg, so that it was not long before their sphere of influence embraced the territories occupied by the main tribal divisions of that people.

Ideles marks the most important point of our route between Fort Flatters

and Tamanrasset. From Ideles we now had to climb to a considerable height; there was scarcely anything to suggest the conventional idea of the desert. The central mass of the Ahaggar is of volcanic origin, and much smothered by its own debris, a phenomenon common to all Saharan ranges owing to the absence of river drainage. This causes the rising slopes to be of a very gentle gradient, and it is only when one reaches the main volcanic outcrops that the Ahaggar presents a really striking group of peaks. Little or no sand was to be seen, and the rocks were loose and slippery for the camels. Though we were approaching the tropics, the continual ascent brought down the temperature and made midday travelling not merely practicable, but enjoyable, at the same time producing nights that were quite cold. No sooner had we left Ideles than we were overwhelmed by a heavy storm, and sheltered under some massive boulders. Rain is fairly rare in the Ahaggar, being annual to triennial in occurrence, and coming usually in the summer, when there is rain in the Sudan to the south. Two hours' journeying brought us to Hirhafok, peopled and cultivated by the former slaves of the Tuareg. We were warmly welcomed, and a reed hut was placed at our disposal. A witch-like old hag was caught rifling our baggage, whereupon an old man threw her to the ground. During the next few hours she intermittently screamed and muttered imprecations in a manner indicating mental deficiency. A thunderstorm broke over us while we were loading our camels to set out, and we were well soaked.

Next day going was steep and difficult; we crossed many fast-running streams caused by the previous day's rain, and remarked on the grotesque, distorted forms of the rocks. We passed 12 miles to the east of the peak Tahat, which is estimated to be 10,000 feet high. This mountain is not very striking in outline, though its neighbour, Ilaman, but a few score feet less in height, is of an abrupt, pointed form, and has so far never been ascended. Owing to the impossibility of carrying up sufficient water we could attempt no peaks, although in winter months this would be quite a feasible enterprise. Supplies can be carried to the base from Tamanrasset in three easy days' journeying.

On July 10 we crossed the last high pass before winding down numerous gorges to the open plain in which lies Tamanrasset. This is the French base in the Tuareg country, and it was chiefly founded by the Père de Foucault. The chief encampment of the Ahaggar Tuareg nobility is situated at Abalessa, some 50 miles away, where pasturage is plentiful.

We entered Tamanrasset on July 10 and were hospitably received. A handsome mud building was placed at our disposal. All military structures are built of the same materials unless stones are readily available. We viewed the well-appointed swimming bath, and also made friends with the professors of the new scientific research station. It appears that the ultra-violet rays are less powerful at Tamanrasset than they are in France on a fine day, so that photography is not always a success. We had always found it quite safe to travel without head covering even at midday. At that time there was mist in the region of Tamanrasset indicating rain some 500 or 600 kilometres to the south. The significance of this phenomenon is well known to the Tuareg, who at once set out with their camels to take advantage of the resulting quick-growing pasturage. The mist is caused by minute particles of clay which are transported by Sudanese storms to these desert latitudes.

In Tamanrasset we sold our two camels, one of which had cost us the equivalent of 2000 francs at Mjeira, the other being Ferreg's baby camel, for 900 francs, a satisfactory price taking everything into consideration. We engaged a new Targui guide, Agurkla by name, of the Dag Rali, a tribe of the Atakor Tuareg, and a camel driver called Ora, and we hired some camels. Just before setting out we received a visit from the Tuareg king, a stout man in his sixties, who had arrived from Abalessa on the day of our departure.

Leaving Tamanrasset on July 19 we bore in a south-south-easterly direction towards Anou-n-Tihok, then south to I-n-Guezzam—which lies approximately halfway between Tamanrasset and Agadez—then south-east again to Agadez. We soon reached the well of Anfeg, lying in a well-pastured valley. It was surrounded by façades of rock amongst which the roars of the camels echoed and re-echoed. The place was swarming with hornets of a very large size, their sting being extremely painful. At this well was the last water we could hope to find for 230 kilometres, a matter of from four to six days, according to the condition of the camels.

We had not long started on the stretch to Anou-n-Tihok when the younger baggage camel became ill and was soon vomiting. The next day the other baggage camel flopped, and had to be beaten up. The power of the sun, and the vileness of the water in the new *gerbah*, which developed a foul smell, were collectively making things rather unpleasant. The Tuareg apparently line their goat-skins with a mixture of rancid goat fat and the juice of a species of acacia tree. We were by no means encouraged by Agurkla's misgivings about the possibility of the well at I-n-Tihok being dry. If such should prove to be the case, we would have to deviate to I-n-Altei, two days' and two nights' journey, which would mean exceeding the limits of safety, even with fit camels, and such was far from the case. The aspect of the desert was depressing—mostly flat and featureless. There were occasional lines of half-smothered cliffs which were soon traversed, but these were rare, and never of any great height. The whole of this area is terribly dry. To a certain extent Agurkla used landmarks—when there were any, but he seemed to depend much upon a sort of atavistic instinct. On several occasions, as we shall have cause to relate, he did go astray, but somehow he managed to re-orient himself. The map was very bad. The only existing map of this country is one based on notes taken down by travelling soldiers, so that it is no more than a small-scale sketch-map. A start has however been made in carrying out an accurate air survey farther to the north, and in the next few years we may expect first-class maps of these areas. As we proceeded over the flat tanezruft, there were interesting mirage effects, and the sun rose one morning with the appearance of being a battered old felt hat.

About seven one evening we reached the rocks of Anou-n-Tihok, and a sandstorm bore down upon us in its fury. After it had cleared we heard human voices, and a caravan of five Tuareg and fifteen camels appeared from among the rocks. The leader assured us that there was water in the well. After the customary delay for conversation they left us to find it for ourselves, and we all set to work, but it seemed almost hopeless in the moonless night. The *rochers déchiquetés* here are of the most extraordinary formation, and very baffling, with their great finger-like processes standing strikingly out of the sand. We

had been moving that day for sixteen hours, and had wasted a further hour and a half in fruitless search, so we lay down and rested, determined to seek by daylight. We awoke at 5.30 and found that Ora had discovered the water in the only well of five that was not dry; he was 15 feet down, digging in the sand. After we had refreshed ourselves and our camels we looked about us and were astonished to note the great quantity of the remains of ill-fated camels, and we began to speculate on how it was that so many had come here to die. There was no pasturage at Anou-n-Tihok, so we filled some of our *gerbah*, sparingly for the sake of other possible travellers, and even then we nearly exhausted the well.

It was on a slope south of Anou-n-Tihok that we remarked on a peculiar hollow sound given off by a firm surface of sand, similar to the sound made when a stone is bounced on ice; merely rapping the sand with the knuckles had the same effect. On July 27 we were held up by a heavy dust cloud of the finest of dust particles that hung like a fog and obscured everything. The guide again had to acknowledge himself lost. Happily the fog did not last, though later we were informed that the phenomenon sometimes will persist for several days. Agurkla went ahead alone and found the landmark he was looking for, which put him on the right route. The old camel grew weaker, and though travelling quite free, he could scarcely move his bones. Our water had now become so thick that we could not see the bottom of our mug with only half an inch of water in it. We had felt relieved on reaching Anou-n-Tihok, but we felt devoutly thankful on reaching I-n-Guezzam on July 29. We drank copiously of the fresh cool water until our noses bled. Here we were entertained by a *sous-officier* and a German legionary, who were building a mud fortress. At this point we met the Agadez-Tamanrasset motor track, and the fortress was being built as a sleeping house for travellers, and fuel store for vehicles. There is a large fallen acacia tree close to the well which is a landmark for many miles.

Seven kilometres south of I-n-Guezzam we crossed a slight ridge forming the boundary between Southern Algeria and French West Africa. Visibility was good, and we had a very fine view of the plain, utterly flat and barren, the tanezruft dissolving into the calm hot sky. We were now crossing but one small corner of the great tanezruft, which stretches far out to the west. Two days later we found evidence of a more substantial vegetation of former times in the shape of multitudes of fossilized twigs and branches, and we even discovered great fossilized tree trunks. Specimens of these were sent to the Natural History Museum at South Kensington, but they were too indistinct in their minute structure for a name to be put to them. There were signs of a more recent fauna in the quantity of fragments of the shells of ostrich eggs.

On Thursday, August 4, we entered upon wet conditions, coming under the influence of the mountain system of Aïr Asben, where vegetation approached the luxuriant. Rain had recently rallen, and we watered the camels and filled our *gerbah* from the pools and streams. The previous evening we had assumed a lake of water to be a mirage—the reverse of the normal—and had turned our backs on it. Gazelle appeared in plenty, and there were numerous jackals, and herds of wild cattle. Early next morning a heavy storm broke over us. We hurriedly packed our things together and transported them to higher ground, returning for odds and ends of baggage, and having to seek for them

under the muddy water. An hour later we had to move again. Eventually we found ourselves stranded on a little island in the midst of a vast lake. After six hours the "fountains of the deep" dried up, and we tried to advance on our route, splashing and sliding in the wet mud. Riding was out of the question. The camel was not created or evolved for wet conditions. By three in the hot sunny afternoon we were still on boggy land, but Agurkla managed to steer us through it.

The following day our guide again had to admit that he was lost; we tried to help him to locate the position by taking bearings on various objects, but in the end had to abandon the attempt. We decided to steer south-south-east, and wait for something to turn up. A further development occurred to upset our plans, for one of the camels took leave of its senses, bucking, jumping, and roaring in an uncontrollable manner. Agurkla tried in vain to quieten it, but it became even more insane, until it eventually collapsed, and could not be induced to rise even to a sitting position. We bled it, and it recovered some hours later, so that we were able to continue our journey, still in a south-south-easterly direction, but quite puzzled as to our precise whereabouts. Rain had threatened, and we hoped that it would come and enable us to lay in ample supplies of water, as our position was very uncertain. By good fortune we found two shallow pools of muddy water that had remained from previous rain. A few hours later a mountain appeared dimly on the horizon—the peak called Azuzo—the landmark we had been seeking for two days. We passed eventually between Azuzo and a neighbouring summit, and then bore greatly to the east. We entered the Wadi Sekkiret, and Agurkla was still feeling his way cautiously. Here we met a camel breeder with whom we left the aged camel, and he put us towards the direction of Agadez. It was here we ran into a thick cloud of rain and sand intermixed, and the result manifested itself in our faces being turned mauve. On August 9 we reached the Wadi Debla, where one of the camels collapsed in a pool of water, sinking fully 4 feet into the mire, and was extricated with difficulty. On August 10 we saw the first reed huts of Hausa shepherds. The valleys were now taking on a tropical aspect, and were overgrown with huge trees amongst which were hundreds of birds. These had mostly come from the south as a result of the rains.

The rest of this 500-mile stretch from Tamanrasset to Agadez was made under very difficult conditions, owing to the heavy storms, and the valleys were filled with water, which reached sometimes up to our waists. Managing the camels was a very hard job, and when we struck a particularly treacherous piece of ground, one of them became hopelessly bogged. Though we unloaded him and pulled him, he resisted our efforts and roared out his annoyance. This was our salvation, for it brought to the scene a massive Hausa and two Tuareg from a neighbouring encampment, and with the united efforts of the entire man-power present, we managed to rescue the unfortunate and unwilling beast, and tow him along the slippery mud.

Between ourselves and Agadez a very rapid current of water was flowing, and we were obliged to wait overnight in the hopes of a subsidence. The next morning the current was less violent, and we crossed over. Now however we found another river in front of us, which was evidently deeper and swifter than the first, and 30 yards wide at its narrowest part. There was no time to weigh

and consider, since a storm was in progress at the time: we plunged in and somehow contrived to effect a crossing without much damage and no loss, and then hurried through the trees barefoot and knocked up the garrison in Agadez. We were given whisky, and changed into dry clothes, and were treated with every kindness, being conducted to the uncompleted but extremely comfortable guest-house. We remained five days in Agadez, held up by the floods that had cut off the town.

We left Agadez on August 17, making south to Abalemma, thence to Gangara, and from there south-west to Tessawa and Katsina. From Katsina we took the old track in a south-easterly direction to Kano. Leaving Agadez was almost as difficult as entering, owing to the miry state of the clay along which the camels skidded, or in which they stuck. Not only was there trouble underfoot, but in addition swarms of mosquitoes plagued ourselves and the camels. Eventually we managed to get to higher ground to the south of the Tijeddi cliff after crossing the wide Anuar valley. At the top of the cliff we met a tribe of Tuareg with servants and animals, who told us that they were coming to make use of the verdant pasture in the valley, which had appeared as a result of the rain.

In a few days the uneven nature of the country gave place to graceful slopes densely covered with bushes and trees. We passed through the northern Gangara, where wild scenes took place in the night, resulting in a murder, which was related to us by Mokta, our Hausa cook. We passed the tiny village of Gao. Yegadje came next, where we were welcomed by the village chief. Ourafan and Gourjae followed, and then we reached Tessawa in the evening of August 28, where we parted with our camels and their Hausa cameleer, though we kept our cook-guide. Tessawa is a town of some considerable size with a civil administration, and possesses some interesting dye works; we examined the pits and the wells and the long lines on which the dyed indigo cloth was hung out to dry. The Tuareg come yearly to buy this cloth, as well as the millet, which they exchange for camels and salt. We were struck by the well-fed appearance of all the animals, so different from what we had been accustomed to see in the desert valleys. It was difficult to believe that all this luxuriant vegetation was but the effect of the rainy season and that for half the year the country reverted to semi-desert conditions.

We hired Sudanese ponies from the local chief, who also provided four runners almost as fleet as the ponies, and of surprising endurance. The ponies preferred cantering to galloping or walking, but progress was slow owing to the laboured pace of the oxen which carried the baggage, so we did not average more than 20 miles a day. The inhabitants of the villages through which we passed make their own agricultural implements, weave cloth, and grow millet, so that they are virtually self-supporting units, save for defence against a powerful invader.

In a very untidy condition we rode into Kano on the morning of September 10. We stayed four days in this modernized city and then took the train to Lagos. After a short stay in Lagos we returned by sea to England.

In conclusion may we say how grateful we are to the French authorities and others who extended to us their warm consideration and courtesy, and so enabled us to travel with such a feeling of security.

JOOS VAN GHISTELE AND HIS TRAVELS IN THE LEVANT

G. R. CRONE

AMONG the books presented in 1925 to the Society by the late Mr. A. P. H. Hotz is 'Tvoyage van Joos van Ghistele,' Ghent, 1557. Mr. Hotz regarded this as one of the rarest in his collection. As it presents several points of interest, and there is apparently no account of it in English, the following notes may be of interest.

The title of the work begins thus: Tvoyage van/Mher Joos van Ghistele/oft anders Texcellent/groot/zeldsaem ende vremd voyage/ghedaen by wylent/Edelen ende weerden Heere/Mher Joos van Ghistele . . . Tracterende van veelderande wonderlicke ende vremde dijnghen/gheobserueerd ouer d'Zee/in den landen van Sclauonien, etc. . . .

There then follows a rather lengthy list of countries, purporting to be those visited by Ghistele. It includes those actually visited, the Holy Land, Egypt, and Sinai, and others about which accounts are given in the text, *e.g.* Persia, India and Tartary.

The imprint is: Te Ghendt/By Henric van den Keere/ghezworen Drucker van sConijnghs ons gheduchts Heeren Munte. M.CCCCC.LVII.

There follow letters in French and Flemish by the printer; a list of the authors quoted in the text; and a preface by "Ambrosius Zeebout Priestre," the narrator.

There are 348 pages, numbered, in Gothic type. (The last leaf is wanting in the Hotz copy.)

A reprint, with the text unaltered, appeared at Ghent in 1563, and this was reissued in 1572. Saint-Génois refers to a French edition published at Lyons, but I cannot trace this. Three issues in fifteen years show that it attained considerable popularity in Flanders.

References are made to it in Brunet's 'Manuel du Libraire, etc.,' vol. 2 (1842), in Saint-Génois' 'Voyageurs belges du XIII^{e} au XVI^{e} siècle,' vol. i (1846), and in Paquot's 'Memoirs pour servir à l'histoire litteraire des Pays Bays,' vol. xviii (1762–70). It is extensively quoted in Heyd's 'Geschichte des Levanthandels im Mittelalter,' vol. ii (1879), for the light it throws upon trading conditions in the Near East. Van Ghistele was not included by Lord Curzon in the list of European travellers contained in the first volume of his 'Persia and the Persian Question.' Brunet regarded it with some suspicion, for he remarks that "Ce qui la rend curieuse, c'est qu'elle paraît être faite de bonne foi." Paquot says that it appears "être fort sincère," but adds "C'est domage qu'il ait manqué de critique, et qu'il ait crû bonnement les traditions populaires, et les fausses merveilles, que des gens crédules lui ont debitées." Heyd obviously had no doubt of its general authenticity, and Saint-Génois and other commentators grow enthusiastic over the qualities of their fellow-countryman as a traveller. It seems worth while therefore to endeavour to ascertain how extensive his travels were, and the character of the book.

There appears no doubt as to the authenticity of Van Ghistele as a historical personage, though neither the date of his birth nor of his death is known. He

held high office in the service of Charles the Bold, Duke of Burgundy from 1467 to 1477, and later in the civic life of Ghent. The period of his travels was from 1481 to 1485.

It is important to note the circumstances and objects, as set out in the preface, which inspired the publication of the travels. The motives were mainly patriotic. In his address to the reader, in Flemish, the printer asserts that he was moved to undertake the work by the recent success of books on the same subject by German and French writers—notably Bernard van Breidenbach, P. Belon, A. Thevet, and G. Postel—being of the opinion that his compatriot's work was at least equally worthy to be widely known. "Zo hebbe ic ooc uut rechter ialousien eñ liefden ons lands ghemoueerd gheweest eenen vlāe-schē Voyagier in tlicht te brijnghen." Other considerations were that, unlike other pilgrims, Van Ghistele had spent four entire years abroad, and had not been impelled by motives of gain.

The history of the book before publication is by no means clear. The printer states in his dedicatory epistle that the book (*i.e.* the manuscript) had come into his hands the previous winter. He later explains his dedication to Philippes de Liedekeercke, husband of Van Ghistele's granddaughter, on the grounds that he owed to him "la Copie originale dudict Discours." The preface which follows is written by "Ambrosius Zeebout Priestre, bescriviuer van tnaervolgheñ voyage," who is elsewhere stated to have accompanied Van Ghistele throughout his travels. But it is possible that a further hand had a part in giving the book its final shape, for the printer refers to "le petit de labeur qu' auons faict à l'educatiō d'icelle." There is no means of determining who the actual author or authors of the final text were. This does not perhaps matter greatly, so long as it is recognized that what may be called the original journal had been extensively edited before publication.

It is not proposed to examine here the itinerary in detail. The title-page gives some idea of the extent claimed for it. The narrative is essentially that of a pilgrimage to the Holy Land. Van Ghistele and his four companions set out in 1481 from Cologne up the Rhine valley, through Austria and Lombardy to Rome. Thence they repaired to Venice, where they embarked upon a galley owned by "Mathias de la Tor," and, coasting the eastern shores of the Adriatic, eventually reached Beirut. There they lodged with another Venetian, Jacome Gabrielis, before proceeding by Saint Jean d'Acre and Jaffa to Jerusalem. After a lengthy sojourn in the Holy Land the travellers set out for Egypt, where they visited Cairo, Damietta, and Alexandria. Descriptions are given of the pyramids and the Nile, and there is an account of an interview with the Sultan. The author attempts to reconcile the evidence on the sources of the Nile to be drawn from Genesis with the opinions of Ptolemy and the classical geographers, and records the view that its floods may be due to its sources lying in a region where it is winter when Egypt is enjoying summer.

The travellers then joined a caravan with the intention of visiting Mecca and Aden. The caravan journeyed through Suez into the peninsula of Sinai to the port of Al Tor, visiting on the way the Monastery of Saint Katherine, of which an extended description is given. At Al Tor the travellers met two Italian merchants, a Venetian, Bonavito del Pan, and a Milanese, Benedicto de Novero, who were engaged in the Oriental trade. It is interesting to note

that a Bonajuto d'Alban, or Dal Pan, is known to have been a merchant and to have travelled in these parts and in India between the years 1486 and 1505. If this is one and the same man, as appears probable, this fact is evidence for the reliability of this portion of Van Ghistele's travels.

Embarking at Al Tor for the island of Aden, the travellers touched at "Al Casser" (Kosseir) and "Souakin." When they reached Aden however they were prevented from travelling further by the "Amyrael," and obliged to return to Al Tor. The importance of Aden as a trading centre for Ormuz, Abyssinia, and the "land of Saint Thomas" is emphasized. It is claimed that there they saw elephants, giraffes, and other strange animals. The account of the Red Sea bears some resemblance to that of Varthema, who was there early in the sixteenth century. "Zijddene" is mentioned as the chief port for "La Mecha." Aden is said to have been two islands at one time, but they were then joined together, lying in a part of the sea known as "Lestroict Tubrin," with another port, "Bufarel," nearby. It is probably impossible now to determine whether the travellers actually made this voyage (the form "Lestroict Tubrin" suggests the incorporation of material from other sources); the account however embodies at the lowest valuation details picked up from merchants at Al Tor. The travellers then went to Cyprus, and thence to Beirut, where they lodged with a Venetian, "Alowyso Dolfini," before setting out for Aleppo.

A description is given of the latter town, its European commercial establishments, and its relations with the countries lying to the east. Heyd praises the book as being the only fifteenth-century account to preserve these details for Aleppo. The story then goes that they joined a caravan proceeding to Persia. For reasons given later, I have examined the sections which follow in greater detail, and have attempted to establish the identity of the stages, the names of which are often given in corrupt forms. If Van Ghistele actually made this journey he is deserving of a prominent place among early travellers in the East. In identifying the place-names I have made use of the anonymous Venetian merchant's account of a journey along substantially the same route between the years 1516 and 1520, which is translated in the Hakluyt Society's volume, Ser. I, 49, from Ramusio's version. The Venetian's names are less corrupt, and most of them have been identified by the editor. The map in Lynch's 'Armenia' was also useful. It may be mentioned that as Ramusio's version was not published until 1559, it cannot have been used by the editor of Ghistele's travels.

From Aleppo the route lay north-east to the Euphrates, passing through the villages of "Bier" and "Heylhaer." On Buckingham's map of the caravan route from Aleppo there is a stage marked Hailan, which may correspond to the latter name. The route crossed the Euphrates at "Albier," where there was a castle; this is now Bir, or Birejik. The next stage was to "Hurcaldeorum (Hurcasdin)"—the modern Urfa. It was known to the Crusaders as Edessa, and was the capital of their County of Rohes (from the Armenian name Er-Roha). The writer refers to this association with the Crusades, but seems to think that Edessa was a separate city to the north-east of "Hurcaldeorum." He also seizes the opportunity to introduce incidents from the Biblical history of Abraham, who was traditionally linked with the city. The route then struck north for some distance; the next point mentioned is "Aram (Russan)":

this appears to be the Haramiburj of Lynch's map. It is stated to be the dwelling-place of Laban, and the site of Crassus' defeat—but these associations are properly to be credited to Harran, to the south of Urfa. The similarity of names led no doubt to this error of the compiler's. This part of the route led through fertile country and many villages, until "Hamit" was reached. This town is said to stand on a river of the same name, a tributary of the Euphrates. This is probably the modern Hamdin, and the river the Hamdin chai.

The next obvious stage would be across to the Tigris at Diarbekr, but the

The route from Aleppo to Tabriz described by Van Ghistele

compiler appears to have confused the stages, for he next mentions "Assenkijf." This is to be identified with Hassan Kaif, farther down the Tigris, which the compiler compares with Mechlin. The next stage mentioned is a "Khan," or caravanserai, called "Tyabech." It seems permissible to assume that this is a phonetic rendering of Diarbekr, and that the compiler had reversed the order of "Assenkijf" and "Tyabech," for the comparison with Mechlin and the other details given would be more applicable to Diarbekr.

The route then left the Tigris and led up a tributary to "Tchert," the modern Sairt. The next stage presents some difficulty. It is said to be a town called "Ysan (Yuan)." There is a town called Isan shown on the maps of Mercator and Ortelius, but I have been unable to identify it. The Venetian

merchant's account suggests an explanation. He says that just before reaching Sairt he crossed two large rivers known as Bitilis and Isan. The former is the Bitlis Su, which suggests that the Isan was the Bohtan Su. This probability is strengthened by the fact that the next stage mentioned is "Vastan"—for the obvious route between Sert and Vastan ascends the Bhotan Su to a 10,000-foot pass. Further, this portion of the narrative emphasizes the mountainous character of the country traversed.

Vastan is said to lie near a great salt lake of the same name, evidently Lake Van, though the town of Van is not mentioned in the text.

The next stage is "Achchay," the identity of which is not clear. It may perhaps be a rendering of Archag, 20 miles north-east of Van. Though it is referred to as a small village, it may arise from a confusion with the headwaters of the Akh Chai, a tributary of the river Aras, as in the case of "Isan" previously mentioned. This is probable, as the next stage is "Choey," which is clearly Khoi, lying near the Akh Chai. From this point onwards the identifications present no difficulty: "Marant" is Marand, "Souffia" is Sufian, and "Tauris" Tabriz.

When the narrative reaches Tabriz, its style changes. From the departure from Aleppo the account is written impersonally. The description of Tabriz however is written to give the impression that it is the record of an actual sojourn in the city—though, unlike the earlier sections describing the travellers' experiences in the Holy Land and Egypt, it is devoid of incidents, with the exception noted below, and gives no names of persons. They are said to have sought, unsuccessfully, an interview with the ruler, "Jacobey," then about twenty years of age. This was Yacoub, the son of Shah Ishmael, and the particulars given correspond with the date of the alleged visit, that is, *circa* 1484. The chief features of Tabriz that are mentioned are the king's palace and mosque. The travellers are represented as abandoning their intention to travel farther towards the land of Prester John and India after representations by merchants of the increasing dangers of the way. Sections on pygmies and other wonders of these further lands are then introduced, evidently drawn from the classical writers and Marco Polo. Despite these divagations, the book gives quite a clear picture of the geography of the surrounding regions. Mount Ararat and the legend of the Ark, the river Aras, Nakhichevan, the Caspian Sea, and the route to Ormuz are mentioned.

From the above analysis of the journey to Tabriz and the references to Persia it seems permissible to draw certain conclusions as to the methods of the compiler. I suggest that Van Ghistele and his companions did not make the journey to Tabriz; that at Aleppo they encountered merchants from Persia, who gave them the itinerary usually followed by the caravans; and that later the compiler used this as a framework around which he assembled relevant material drawn from a fairly extensive reading. It is therefore beside the point for Saint-Génois, who incidentally believed that Van Ghistele had visited Nineveh, to lament that his hero was prevented from travelling farther afield, and thus from rivalling the achievements of the great travellers of the Middle Ages.

Viewed as a whole therefore the contents of the 'Tvoyage' fall into three sections: descriptions of the countries actually covered by the pilgrims;

information collected at the farthest points reached from others, generally Italian merchants, who knew the countries lying beyond; and finally, where first-hand evidence failed, more or less fabulous stories drawn from the older writers. In attempting to blend this varied material into a coherent whole, the compiler had to face the same difficulties as, for example, the cartographers of the early sixteenth century.

The list of authorities quoted in the opening pages of the book shows that considerable trouble had been taken to give as reliable account as was possible. The classical writers are represented by Aristotle ("in Metheorologicis"), Diodorus Siculus, Pliny, and Ptolemy, among others; and mediaeval writers by Bartholomeus Anglicanus, Nicolaus de Lyra, and Petrus de Aliaco. The latest works quoted are Breydenbach's 'Voyage,' the 'Historie van Godefroit vã Buillon,' and Pope Pius's 'Descriptio Asiae minoris.'

During the existence of the Greek Empire of Trebizond, and Genoese commercial domination of the Black Sea, the main trade route to the east ran from Sinope or Trebizond through Erzerum and Khoi to Tabriz, the emporium for Oriental trade coming largely from Ormuz. In the early period the route from the Mediterranean and Syria, as described by the Florentine Pegolotti, commenced at Lajazzo and, striking approximately north-east, joined the main route at Sivas or Erzerum. After the fall of Constantinople and Trebizond, and the rise of Turkish power in Anatolia, this northern route declined in importance, and the necessity for the detour from Lajazzo ceased. The place of the Lajazzo–Erzerum route was taken by the more direct route from Aleppo, described by the Venetians, and by Van Ghistele, which avoided Turkish territory. The desire for an even more direct route to Ormuz, and the decline of Tabriz as a centre, caused this route in turn to be abandoned, in favour of the desert crossing from Aleppo to Basra, or the descent of the Euphrates. Mr. Douglas Carruthers states in his 'Desert Route to India' that the first European to describe this route was the Portuguese, Antonio Tenreiro, in 1523. Van Ghistele therefore describes the Aleppo–Tabriz route at perhaps the height of its prosperity. For the next three centuries the area it crossed was scarcely known to Europeans. It is curious to compare the accounts given by Ainsworth of the Euphrates Expedition of 1835 with Van Ghistele's: for their historical references they were drawing ultimately from very similar sources.

The 'Tvoyage' thus represents one of the latest in the long series of cosmographical works, which, designated travels or voyages, form a valuable section of mediaeval geographical literature. In its blending of actual experience with extracts from classical authors it resembles the 'Book of the Knowledge of all the Kingdoms,' by the Spanish friar, written *circa* 1350. But the prototype of this class of literature is the Travels of Sir John Mandeville. This comparison is not intended to cast a slur upon any of these works. When allowance is made for borrowings from other sources, a valuable residue of new knowledge remains. These works are but stages in the process by which, in the words of the printer of the 'Tvoyage,' there was substituted "au lieu d'Authorité la Raison."

DR. WILHELM FILCHNER'S JOURNEY IN TIBET

KARTENWERK DER ERDMAGNETISCHEN FORSCHUNGSEXPEdition nach Zentral-Asien 1926–28. Erster Teil: China und Tibet I. By WILHELM FILCHNER. Mit 58 Skizzen im Text, einem Namenverzeichnis und 8 Tafeln. *Petermanns Mitteilungen*, Ergänzungsheft Nr. 215. *Gotha: Justus Perthes* 1933. 255 *pages. RM.*20

FILCHNERS GEOGRAPHISCHE ORTSBESTIMMUNGEN UND Höhenmessungen in Zentralasien. By E. PRZYBYLLOK and K. WALTER. Schriften d. Königsberger Gelehrten Gesellsch. Heft 8. *Halle* 1929.

DIE ERDMAGNETISCHEN BEOBACHTUNGEN VON DR. FILCHNER auf seiner Reise in China und Tibet in den Jahren 1926–28. O. VENSKE. Veroffentl. d. Preuss. Meteorol. Inst. Potsdam, Nr. 79, Bd. IX, Nr. 7. *Berlin* 1931.

OM MANI PADME HUM: Meine China- und Tibetexpedition 1925–28. By WILHELM FILCHNER. *Leipzig: F. A. Brockhaus* 1929. 9×6 *inches;* x+352 *pages; illustrations and map. RM.*15

DR. WILHELM FILCHNER had already in 1903–05 made a great journey in China and north-eastern Tibet, of which the results were published in his 'Wissenschaftliche Ergebnisse der Expedition Filchners nach China und Tibet' (ten volumes and an Atlas of 46 sheets, Berlin 1906–14). About 1924 he planned a return to this territory, and after careful study of what he could best do single-handed and with very limited means, he resolved upon a magnetic survey at stations which he could fix astronomically. A grant from the German Foreign Office and the Notgemeinschaft der Deutschen Wissenschaft gave him the means to equip himself with instruments and to start upon his journey through Soviet territory into Sinkiang and to reach the borders of Tibet east of Kokonor. There his money was exhausted and he was stuck, until by the kindness of friends, a pair of American missionaries named Hayward, an Italian Signor Guaita, the Catholic bishop Dr. Buddenbrock, and an Australian named Jack Mathewson who accompanied him to Leh, he scraped together enough to take him right through Tibet from east to west and out through Kashmir to India. It is a remarkable story of courage and confidence which he tells in the narrative of his journey 'Om mani padme hum,' published by Brockhaus in 1929.

After standardizing his magnetic instruments at Potsdam he set out *via* Moscow and Tashkent with a *visa* from the Chinese Ambassador in Berlin, and the promise that his full passport should be forwarded from Peiping. He got safe across the frontier into Sinkiang, though he had no pass from the Chinese consul at Alma-ata, and in May 1926 arrived at Urumchi, where he was held up on the grounds that he had crossed the frontier without permission and without any *visa* from the Chinese Foreign Office, and that he was using instruments without permission: all of which charges were only too true. But after six weeks at Urumchi he persuaded the Governor to give him leave to continue, and he got round by Siningfu to the monastery of Kumbum, where he passed most of the winter of 1926–27, suffering much from cold and hunger, and appealing without result to his Minister in Peiping for his support and the means to continue his journey. In March he was compelled by sickness to seek the help of the medical missionaries at Lanchowfu, and this seems to have been the turning-point of his fortunes, for in the following month he obtained letters of recommendation from the Amban for Tibet, from Siningfu. Armed with these letters in Tibetan and Mongolian he collected sufficient funds (£125) from his

missionary and other friends, purchased twenty-three yaks at Tangkar, and with Mathewson as his companion crossed the border of Tibet at the beginning of June 1927.

They worked along the southern edge of Kokonor, west and south towards Dsun, and crossed the Marco Polo mountains. Filchner made a number of astronomical and magnetic stations, determined heights by boiling-point thermometer, sketched the topography within sight of the route, and made the "cultural-political observations" which had been in their programme from the start. Without too much difficulty the caravan advanced until they were held up by Tibetan guards after crossing the Dre-chu. Then followed two months of obstruction on the one hand and resourceful insistence on the other. Briefly, the narrative runs thus:

On entering Tibet Dr. Filchner had written a letter to the Private Secretary of the Viceroy of India, asking permission to enter India from Tibet, setting out the scientific programme, and saying that his means were small, but that he had provision for four months. This was sent by Tangkar and Shanghai. When they were held up early in August and the officer in charge of the guard sent a report on them to Lhasa he consented to send also a letter from Mathewson to the Dalai Lama since "all the English had already left Lhasa." On August 25 Mathewson wrote again to the Dalai Lama and to the Viceroy asking permission to go through to India, and the following day a third letter beginning "Dear Sir, This is an SOS from a fellow Britisher, an Australian subject, written from somewhere in Tibet" was dispatched by special messenger to the British representative whom Filchner and Mathewson supposed to be in Lhasa.

Early in September a message from the Khampo said that their letters had been forwarded, but ordered the caravan to return by the way they had come. The local officer in Nag-tochu-ka, on the other hand, promised to send a favourable report to Lhasa, and they prepared new letters to the Viceroy and the Khampo, the latter stating that the Viceroy knew of their approach and that they had no other object than to reach India by the shortest route. If the Khampo hindered them he would be opposing British interests, and they refused to return to China. The Khampo refused, for his part, to forward these letters to Lhasa, but at the end of the month he received orders to treat them well, because the Dalai Lama had been asked by the Viceroy to establish their identity. Dr. Filchner then made over his instruments to Mathewson, "to secure British protection for them," and on October 9 was told that he would be allowed to proceed to Leh. Finally, on October 31, they learned that Lhasa had been requested by the Government of India to forward their journey, and on November 3 they were allowed to proceed. They reached Leh on 5 March 1928 after an arduous journey through the winter; Mathewson, suffering from frostbite, was left there in hospital, and Dr. Filchner went on to close his magnetic series upon Dehra Dun. It is a remarkable story to show how much can be done if you will not take No for an answer.

So much for the bare narrative of a difficult and most trying journey, on which in very bad conditions Dr. Filchner managed to carry through his scientific programme, of which the results are now in course of publication and are the principal subject of this notice.

The astronomical positions, 158 latitudes and 32 longitudes, have been computed and published in 1929 by E. Przybyllok and K. Walter in the Schriften of the Koenigsberg Society. Dr. Filchner had with him a small theodolite by Hildebrand and fixed position lines, generally by the sun; and to avoid delay, with rather small elapsed times, often not more than two hours. He had five chronometers, of which two went wrong before he got into Tibet, and the three

remaining differed greatly. To control the chronometers he observed differences of azimuth between the moon and neighbouring stars: a method which is troublesome in computation but gives more freedom in choice of time than the canonical method of moon-culminating stars. There would of course have been no possibility for him to use wireless. On the first half of his journey when the chronometers were running well he observed seven moon azimuths, found that the results never differed more than five minutes of arc from the chronometers, and adopted the mean of the two. In Tibet he observed nine, and small though the results may seem for so great a labour they provide the first reasonably sure foundation for longitudes in northern Tibet, and are thus beyond price.

The magnetic observations have been reduced by Dr. O. Venske and published by the Prussian Meteorological Institute at Potsdam. The series begins at Pavlovsk on 6 January 1926, numbers 32 to 42 were lost in the Russian post; there are about 75 stations in Tibet; and the series closes on Dehra Dun. This is the first serious contribution to the magnetic survey of northern Tibet, and the results are unexciting only because it proves that Tibet is rather free from disturbance; they fit very well into the curves of variation interpolated across the country between observations to the north and the south.

We come now to the geographical results, which are of great importance and value. Dr. Filchner made frequent boiling-point observations for height above sea and was indefatigable in sketching the topography on the scale of 1/100,000. The work in Tibet will make eight sheets on the scale of 1/500,000, of which the first four were published last year by Justus Perthes with a substantial memoir as Ergänzungsheft Nr. 215 of *Petermanns Mitteilungen*. The maps have been compiled under Dr. Filchner's supervision by cartographers O. Wand and G. Scholz, and are reproduced in colour. They are a contribution of the first importance to the cartography of Asia. Along the route relief is shown by form-lines in brown; away from it by grey hillshading, largely no doubt speculative. Water is in blue, vegetation in green of three tints with overprinted symbols in blue to show five distinct classes of cover; sand is in buff, permanent snow in blue, and routes in red. The maps are cleanly lithographed, but the commonplace lettering is a little unworthy of the rest. A distinguished merit of these maps is that each is accompanied by a full descriptive memoir adorned with little sketches in line, followed by a careful discussion of the material from other sources which has gone into the compilation, with the corrections which have been necessary to adjust positions, especially longitudes, to the framework provided by Dr. Filchner's lunar observations. Some of the routes, including Dr. Filchner's own earlier, must be shifted as much as half a degree. Only after prolonged study and trial could one pronounce on the certainty of the compilation, but it has all the appearance of being very well done, and the cartographers have in their 'Bemerkungen zum Kartenentwurf' made it perfectly clear what they have done and given every opportunity for study and criticism. No one could do more, and the method of presentation adopted by Filchner is a model for future travellers.

In order to gain some idea of the corrections which Dr. Filchner has made to the hitherto accepted geography we have reduced the bare features of his map to the scale of 1 : M and superposed it on the sheets of the Survey of India in the series 'India and Adjacent Countries 1 : M.' We start from Siningfu, which is moved 8 miles east and Kokonor about the same. This shift eastward gradually increases as he goes west, and by longitude 97° has become about 12 miles, the latitudes of the lakes remaining much the same, but the courses of the rivers being greatly changed, and the topography almost unrecognizably different. The general shift of longitudes eastward is maintained in variable extent through-

out the third and part of the fourth sheet until it is reversed in sign in the neighbourhood of the Tung Pass. Dr. Filchner's route was for its greater part untraversed by the other travellers upon whom the Survey of India maps largely depend. Messrs. Wand and Scholz have produced a new variation of the geography adjusted to Dr. Filchner's observations and route and in places differ very greatly from the preceding compilations. The justification for this change will be found partly in the discussion of the material for each sheet and is partly inherent in the necessities for each case, but is on that account more difficult to evaluate. One can say only that these sheets present a view of the geography of northern Tibet which is considerably different from that delineated in the sheets of the Survey of India, and any one might be very well content to accept the detailed map by Dr. Filchner along his route and the relief shown in form-lines on either side without giving the same acceptance to the compilation far away from his route. It is necessary to distinguish between the two. Doubtless the Survey of India will, when they revise their 1 : M sheets, give the most careful consideration to both categories.

Following the four sheets of the topographical map are another four of 120 small diagrams showing the exact position of each magnetic station in its relation to buildings or natural features: a monument to the industry of the observer who was forced to do all his work in secret.

Not the least of Dr. Filchner's difficulties was to deal with the place-names, which especially in the east are a mixture of Tibetan, Mongol, and Chinese. He made careful notes of the names as pronounced, and whenever possible had them written down as well, which could be done more or less certainly for the towns and villages, but hardly at all for the rivers, mountains, and passes. All this material has been worked up by Dr. W. A. Unkrig, who has produced an alphabetical catalogue of all the names on the maps and sketches, in six columns, giving the transcription adopted, the map reference, the Tibetan, Mongol, and Chinese characters when known, and the meaning of the name. Many of these names in their original script are not, we understand, as recorded, but have been reconstructed with the help of several specialists on the basis of published vocabularies, and to what extent such treatment is justified only specialists can say. The adopted transcription is naturally of German pattern, and what will interest British geographers most is its relation to the system used by them, as in the maps of the Survey of India. In response to an inquiry on this matter Dr. Filchner very kindly obtained from Dr. Unkrig and sent to us a long memorandum on the treatment of Tibetan and Mongol names, which will be preserved in our library for the use of students. It is well known that a strict transliteration of Tibetan names produces results that are unintelligible to any one who hears them pronounced, because there are many mute letters, especially at the beginning and end of the words, and many complexes of letters which have pronunciations one cannot guess. Of such peculiarities the British should be the last to complain, but they do in fact find it convenient to write the names phonetically, only of course they do it differently from French and Germans and Italians. Dr. Unkrig has given us tables of the Tibetan characters and complexes, their transcription according to Sarat Chandra Das's Tibetan-English Dictionary, their transcription on Filchner's maps, and what he calls the scientific transcription, which is a precise transliteration with plenty of diacritical marks. And of each he gives an example. The last category need not detain us further than to remark that what is pronounced Ta, Ja, and Da-wa is transliterated Pra, Bya, and Zla-ba, which shows the need of phonetic spelling on the maps. Between Chandra Das and Filchner-Unkrig there are the usual correspondences *ch* and *tsch; j* and *dsch; y* and *j; sh* and *sch*. But there is another *sh* sound which Unkrig

writes *sh* with the intent that it should be pronounced *zh;* and when he writes *w* for our *w* it is uncertain how he would pronounce it. With some few exceptions however the Tibetan names on Filchner's maps are readily rewritten in the British system, and there is a wealth of information about them in the tables and notes. It would seem from Dr. Unkrig's memorandum that the difficulties of dealing with Mongol names are different but equally formidable, and with them British geographers have less familiarity.

To sum up: the German authorities which started Dr. Filchner on his journey and then seem to have been unable or unwilling to keep him going have made amends by the full and costly publication of one-half of his work, and it will be unfortunate if the second half cannot receive as handsome treatment. The Survey of India will welcome these admirable maps and be well content that their Government were able to do something by representations at Lhasa to help their author out of a difficult situation. His friends in China who raised funds at a critical time must be satisfied to learn how considerable a contribution they made to geography by their liberality; and the Australian Mr. Jack Mathewson, who evidently played a spirited part in the enterprise, should feel in its successful issue some consolation for his sufferings at the end of the journey and subsequent ill-health.

THE SWEDISH–NORWEGIAN ARCTIC EXPEDITION, 1931

SCIENTIFIC RESULTS OF THE SWEDISH-NORWEGIAN ARCTIC Expedition in the Summer of 1931. Led by HANS W:SON AHLMANN. Vol. I (Introduction and Parts I–X). Reprinted from *Geografisker Annaler* 1933. *Stockholm: Centraltryckeriet* 1934. 10×7 *inches;* [ix+] 300 *pages; maps and diagrams*

AN appreciation of the work of the Swedish-Norwegian Arctic Expedition of 1931 is overdue, and the completion of Volume I of the Scientific Results provides an opportunity for reviewing what was done.

"The main object of the expedition was physico-geographical research, its working area was North-East Land, and the waters surrounding this." Such is the statement of the leader, Dr. H. W:son Ahlmann, but a glance through the 300 pages of Volume I shows that a great deal more was successfully attempted: in fact the party undertook a complete scientific survey, with special emphasis perhaps on geology and glaciology, oceanography, and atmospheric observations. For the marine work in the seas between Hinlopen Strait and Franz Josef Land the *Quest* came into her own once more, after landing the sledging and base parties.

Dr. Ahlmann had a strong team of scientists: Messrs. L. Rosenbaum, geodesist; O. Kulling, geologist; B. E. Eriksson, meteorologist; and Lieut. E. Christell, wireless expert, from Sweden; and Dr. P. F. Scholander, botanist and doctor; Messrs. H. Mosby, oceanographer; and O. Staxrud, technical expert, from Norway. Mr. S. Malmberg, of the *Stockholms-Tidingen* newspaper, was also a member of the party. It is a pleasure to read that H. Schmidt, who was dog driver to the Central Sledging Party of the Oxford University Expedition of 1924, went back with the party to the island that he swore he would never revisit: it treated him better on this occasion. Another Norwegian hunter, S. Skjelten, also went with him: Skjelten was with Gunnar Horn's party in 1930 and made some of the initial discoveries at Andrée's camp.

The *Quest* reached Moffen Island, well to the north of Spitsbergen, on 23 June 1931, and got into Murchison Bay next day. The base camp hut was erected and the site appropriately christened Sveanor: the sledging party left on July 2, and on the same day the *Quest* forced a passage through the winter ice to the south side of Wahlenberg Bay, near the mouth. The sledging party was able to leave her, start on the winter ice, and reach the land-ice of North-East Land apparently without undue risk or difficulty. In 1924 the sledging parties of the Oxford Expedition could not be landed till July 21, when the bay-ice was drifting out and the summer melt of the ice-cap was already in full swing.

The *Quest*, having parted with the sledging group, continued down Hinlopen Strait and reached the site of Andrée's camp (where a memorial was erected) on July 14. Then, after wireless communication with the leader at Sveanor (who had already completed his sledge journey), she continued her voyage to Franz Josef Land and returned by way of the islands off the north coast of North-East Land to Sveanor. Thus, in just under six weeks, an ambitious circumnavigation was completed apparently without a hitch, important oceanographical work being maintained throughout the trip.

A remarkable ice year, skilful organization, the navigation of Captain Ludolf Schjelderup, and perfect co-ordination by the use of adequate wireless equipment both at Sveanor and in the *Quest*, combined to bring about this highly successful and methodical voyage: it may not be rivalled in these waters for some time.

While the *Quest* was thus employed the sledging party had met with equal success. Striking up to the high inland ice they moved fast over snow-covered ice and firn, still in good condition for travelling. Only at intervals did they meet the abominable surfaces of bare ice, slush, streams, and crevasses that hindered the sledging parties in 1924. Schmidt's dogs were an asset instead of an anxiety to himself and every one else. By Dr. Ahlmann's modest account of a "circular tour" of a large part of the northern interior of North-East Land one's mind is carried back to A. E. Nordenskiöld's description of his journey in 1873, with ice and surface conditions that seemed unbelievable in 1924. Dr. Ahlmann was following his countryman's footsteps, and it is interesting to read that he had access to the original manuscripts of Nordenskiöld's diary: a number of perplexing details and supposed anomalies of the published account[1] are thus explained.

Throughout the period of occupation meteorological observations were regularly made at Sveanor, and a notable journey, of which we shall hope to hear more, was made by boat along the west and north coasts for geological and botanical survey.

Those who are interested in any aspect not only of arctic but of polar work should not fail to study the results of this expedition in detail. A word of appreciation of the method of publication should be added. Certain proportions of the printing space of the *Geografiska Annaler* have been put at the disposal of the expedition, and the general account is followed by well-balanced and lengthy articles by all the members of the scientific staff of the Swedish-Norwegian Expedition, each writing on his own special studies in the appropriate technical terms. The *full* results on any topic can thus be found by reference to this one journal either in its usual form or in the separately bound volumes of the expedition. The whole of Volume I is written in English, with a variety, but uniform excellence of styles, that convey the authors' impressions in a very pleasing manner. Numerous illustrations and large-scale folding maps serve as some indication of the generous use of funds to provide adequate publication.

[1] "The Arctic Voyages of Adolf Eric Nordenskiöld," London, 1879.

The following are brief summaries of some of the more important discoveries and conclusions.

The sledging party found that the north-west dome of ice is separated from the main, or eastern, ice by a broad land-valley, thus confirming the impression gained in 1924. I am told that, as a result of this discovery, trappers (including the redoubtable Lindquist) are picketing the valley during the present winter, as it is believed to be a bear-route from the north coast of North-East Land to southern Hinlopen Strait.

They traversed 350 km. (about 218 miles) in seventeen days. Their course lay from the south side of Wahlenberg Bay, near the Clarendon Cliffs,[1] along the crest of the southern ice and then north-east across the interior to a point about 25 km. south-west of Cape Leigh Smith. The return journey was almost due westward to Sveanor in Murchison Bay. This is by far the most comprehensive route yet covered in North-East Land. The equipment included light-weight couches to ensure dry sleeping berths: these were taken in view of the Oxford sledgers' experience in 1924, and although little serious melting was encountered —the party got back to its base just in time—they proved a great success. Future expeditions might well take note. Long series of altitudes were obtained by accurate methods, and contours of the ice-caps are now available. All previous accounts of the "ice-canals" are now brought together by Dr. Ahlmann and to a great extent harmonized. Attention is drawn to the remarkable feather-edges of the ice-caps at their margins, in contrast with the steeper marginal slopes of Greenland. These, the "dead ices" (or carapaces[2]), the obvious recessions and lack of signs of local advances, have led to the conclusion, which none will dispute, that the glaciation of North-East Land is now in a passive or recessive stage. To this Dr. Ahlmann adds the wise caution that there have been no *marked* changes since 1873; he has also provided a useful summary of records that go to show that the ice of Spitsbergen as a whole is in a similar state, and he has drawn some suggestive parallels with Scandinavian glacier oscillations. Some important observations on the glaciers of Lomme Bay, East Spitsbergen, must receive the attention of all investigators of the main island. It is shown that there is a marked lowering of the glaciation limit from above 450 metres in western North-East Land to below 100 metres in the eastern isles. Suggested classification of glaciers on morphological and on geophysical bases should interest glaciologists both of polar and temperate lands.

In the final sections of the volume Dr. Ahlmann, with A. Ångström and J. E. Fjeldstad as contributors, shows that ice-profiles, based on reliable data, indicate that at the tops of the domes the ice is probably not more than 200 metres thick. With the exception of ice-filled depressions, the general thickness is probably well below this figure, and the gentle "feather-out" is noteworthy. Here Dr. Ahlmann expresses the opinion that much of the ice is frozen to the subjacent ground, a conclusion to which I would subscribe.

J. E. Fjeldstad, in a highly mathematical consideration of snow and ice temperatures, has some interesting things to say on the negative temperatures of the body of the ice. Perhaps it should be noted however, that in spite of these temperatures, large bodies of water were transmitted englacially by crevasses at the peak of the thaw in the summer of 1924 at any rate, and this is probably an annual event. The volume and speed of the water evidently then prevents it from freezing, whereby it would bring itself to rest and fill the deep crevasses with solid ice.

[1] See map, *Geogr. J.*, vol. 66, 1925, p. 20.

[2] The application of this term for these characteristic ice-forms is suggested in *Geogr. J.*, vol. 74, 1929, p. 458.

The concluding section of glaciology brings the leader's earlier observations to a climax in a survey of the ice-caps and glaciers of lands surrounding the Norwegian Sea, including Greenland. Basing his conclusions partly on *isoglacihypses* (=contours of glaciation limit) he shows, among many other things, that the highlands of Scotland narrowly miss the possession of a permanent glacier or two that would make all-British winter sports almost as realistic as a patriotic press recently would have had us believe.

These conclusions are illustrated by a map and are broadened to include differences between arctic and alpine ice. We are reminded that radiation is continuous in summer in the lands of the midnight sun, whereas it is virtually diurnal only in more temperate latitudes. Differences between firn and ice of Greenland—Svalbard—north and south Norway—Alps may thus be detected. Dr. Ahlmann suggests the grouping of glaciers in terms of these and associated factors. Students of polar, temperate, and inter-tropical ice must one and all pay attention to these surveys of facts and theories, some of them long known, some new, but now combined in a very attractive way. Perhaps for the benefit of some geographers and of some others who at times conjure up past ice-caps in a lighthearted way, Dr. Ahlmann reminds us that cyclonic activity promotes glaciation on the windward side of maritime lands by the reduction of radiation-ablation and the increase of precipitation. Similar activity impedes glaciation of continental lands by increasing ablation due to wind evaporation.

A. Ångström introduces some significant facts concerning the dependence of ablation on air temperature, radiation, and wind, severally and collectively. These studies for extra-Antarctic lands are welcome. That ablation increases with rise of wind velocity is of special importance in the control of comparatively small ice-masses. The factors deduced for North-East Land, with proper allowance for amount of cloudiness and other variable quantities, are satisfactorily compared with results obtained by the *Maud*, in Norway, and in north-west Spitsbergen (by H. Ritter). It is concluded that at Sveanor the *total* ablation is 1 mm. per hour during about sixty-five days per annum. This figure decreases as the firn line is approached.

Some deductions by A. Ångström concerning the total radiation from sun and sky, based on the use of a Robitzsch actinograph, should receive the attention of those concerned with polar meteorology.

B. E. Eriksson has contributed a valuable section on climatology and meteorology. The variety and number of instruments, and consequent observations available from Sveanor, the *Quest*, and the ice-cap party, should be an object lesson to small summer expeditions and some others. The tables of results and their analyses should be studied by specialists. It is concluded that there is no diurnal change of temperature or wind, and that North-East Land is almost entirely under the influence of the atmospheric changes that affect Svalbard and the northern seas as a whole. It should be noted that the sledging party was observing (1) early in the season, (2) for the most part on the crests of the ice domes, (3) in a year of exceptionally ice-free neighbouring seas. For these and other reasons the winds experienced mainly on the flanks of the domes and in the hollows late in the season of 1924 seem to be alien to those recorded in 1931, and I am not convinced that they are fully explained by the observations of that year.[1] There is need here for synchronized recording by a network of stations. Eriksson suggests the probability that Hinlopen Strait is a low-pressure area, and here, I believe, he has found the solution of the problem.

[1] *I.e.* the fact that strong winds flow down the flanks of the domes and transport much snow from the higher parts.

In addition to Dr. Ahlmann's sections on the inland cartography and glaciology, two other sections are devoted to cartography and surveying methods. The first, by the same author, includes a most welcome and valuable summary of the history of the cartography of the regions which will remain a standard work for reference. He also reminds us, with good reason, that insufficient attention has been given to sealing skippers' reports. These are often accurate and made by shrewd and interested observers. He quotes Jens Olsen's information about ice-free land south of Rijp Fjord and Cape Leigh Smith, which proved to be fair and lucid descriptions. Olsen had walked over the ground.

The second part of this section, by L. Rosenbaum, gives chapter and verse for some of the much-needed determinations of latitude and longitude, which he made notably on Moffen Island, Great Island, Giles White Island, and Andrée's camp, Foyn Island, and Charles XII Island, a remarkable record for a single season. As a result of his observations Cape Leigh Smith is moved 17 km. north-west of its previously supposed position [1]: here we hope it will remain indefinitely.

In the other section, on Special Cartography, Rosenbaum explains his surveying methods—phototheodolite, two theodolites, Dumpy level, plane-table with tacheometric alidade. Heights, when not otherwise determined, were calculated both on the coast and in the interior from readings of Paulin aneroids, with Sveanor, the *Quest*, and the synoptic charts as controls. From details given me by J. M. Edmonds, I gather that the Oxford sledging party in Ny Friesland in 1933 and Rosenbaum in North-East Land encountered much the same difficulties and disadvantages in the use of photogrammetric methods. Like most others, they are ideal in the right surroundings, but waste much time and effort in the frequently foul weather of Svalbard as a whole.

Special interest centres round paired photographs of Drabenten, a satellite of Charles XII Island north of North-East Land. Photographs taken in 1898 show them to be separated by a narrow strait; in 1931 they were found to be joined by a long low spit. Further detail of the nature of this recent change will be welcome.

In his section on geomorphology Dr. Ahlmann divides his attention between an enlightening discussion of the topography of the sea bottom—based on the large number of soundings made by the *Quest*—and an analysis of the visible land. He has some interesting things to say about the strandflat that lies between the two. He rightly points out that the more soundings are taken the more irregular, involved, and perplexing does the contour of the sea-bottom become, with special reference to the Norwegian and Barents Seas. He is prepared to admit an elevation of about 200 metres in fairly recent geological times, and to this extent he attributes some of the topography now re-submerged to subaerial denudation. On the other hand he firmly believes in some tectonic *origins* of certain major features of both positive and negative relief. We should emphasize the word "origins," for Dr. Ahlmann is a disciple of the school of thought that believes in glacial over-deepening and moulding to great depths. He has naturally paid much attention also to the remarkable peneplain-like land surface of North-East Land, which is so prominent a feature of much of Spitsbergen. He points out that the surface is evidently in a far more perfect condition under the ice-cap than it is near the coast. This suggests long-continued protection—presumably by the ice—and one wonders if there is not an association here with the very important observations of the same sort made by L. R. Wager in Greenland,[2]

[1] *I.e.* the position assigned to it in 1926; see F. A. Worsley, 'Under Sail in the Frozen North,' London, 1927.

[2] *Geological Magazine*, April 1933.

and with the deduction that at any rate some of the Greenland glaciation may have originated far back in Tertiary times. If the analogy is admissible it would be reasonable to query the opinion that the general body of North-East Land ice is perpetually moving slowly outward, from the central parts of the domes towards the perimeters. My own impression was that movement was localized to certain (probably preglacial or interglacial) channels, and that the main mass was motionless.

We shall await the report of the geologist with keen interest: we are told enough to realize that he has made great discoveries in the Hecla Hoek formation—huge accumulations of porphyry, tuffs, and agglomerates under the limestones, dolomites, schists, and quartzites of the Murchison Bay series, with tillites and laminated schists resting concordantly above them. Overlying dolomites, schists, and quartzites include, I understand, beds with veritable fossils provisionally assigned to a Lower Cambrian age. These are epoch-making discoveries.

K. S. S.

NEW SHEETS OF THE LAND UTILIZATION SURVEY OF GREAT BRITAIN

CROMER, KESWICK & AMBLESIDE, IPSWICH, LIVERPOOL & Birkenhead, South Mainland (Shetland Islands), Firth of Forth. *Southampton: Ordnance Survey* 1933. *4s each, flat and unmounted*

THE first two sheets of the Land Utilization Survey to appear were reviewed at some length in the *Journal* for June 1933 (vol. 81, p. 541); since then the five sheets enumerated above have been made available. There are many inventories of land, from Domesday to the returns of the Ministry of Agriculture, but this survey represents an enormous advance in presenting the information in map form—the most complete, concise, informative, and intelligible method of showing distributions. It offers a wide field for exercises in the correlation of land utilization with geology, soil, hydrography, altitude, climate, communications, and relation to markets; the distinction between the predominantly arable boulder clay and the heaths and rough grazing on the gravels of East Suffolk is an example that strikes the eye at once; the water meadows along the East Anglian rivers and the surviving mosslands of the Lancashire plain are others. At the same time the scale and accuracy are such that the falsity of many popular generalizations can be readily exposed. The limits of utilization types do not, for example, coincide exactly with geological boundaries, even where these are accurately and reliably delineated on the Drift edition. In this connection it will be interesting to examine the Land Utilization maps, when they appear, of an area such as Ayrshire, for which reliable soil maps on a 1-inch scale are available.

As was to be expected, difficulties are being experienced in applying the simple system of classification adopted to regions of widely differing husbandry. There is, for example, no purple (gardens, allotments, orchards, or nurseries) on the Shetland map, and croft farming is portrayed as entirely arable (brown). Again "fenland and marshland unfit for grazing," *e.g.* round the broads of Norfolk, is shown red, but some very similar types of country on the Ipswich sheet are coloured yellow (rough pasture and saltings), and in one place even the foreshore appears from its yellow colour to be fit for grazing. Some slight modifications and elaboration of the original classification appear to have been made in the

later maps (Keswick and Ambleside and Firth of Forth). The purple, which has always been unsatisfactory in showing suburbs as if they were extensive gardens, is now subdivided into "Houses with gardens sufficiently large to be productive of fruit, vegetables, flowers, etc." And "New housing areas, nurseries and allotments." But actually there is no change as the former of the categories is differentiated merely by purple printed over the black symbol normally used on the Popular base map to show buildings. Similarly land agriculturally unproductive purports to be divided into "Land so closely covered with houses and other buildings or industrial works as to be agriculturally unproductive" (red on black), and "Yards, cemeteries, pits, quarries, tipheaps, new industrial works, etc." (red only). Again Forest and Woodland (green) is divided into deciduous, coniferous, mixed and new plantations with a note that "woodland cut down and not replanted is shown by the black symbol of woodland in the colour of the present utilization, generally yellow (heathland)." Actually, of course, the symbols for the different types of woodland are those present in any case on the base maps, new plantations being shown by green with no black symbols, and the new classification is in reality no fuller than the old. The "new plantation" category and the "woodland cut down . . ." simply indicate that where afforestation or deforestation has occurred since the publication of the Popular map the Land Utilization map brings it up to date. There is of course no indication whether the new plantations are coniferous or deciduous.

But it would be unfair to criticize the maps on these grounds; nobody is more keenly aware of the limitations of the classification and the difficulties which constantly arise in its application than the Director himself. The discussion that followed his paper read to the Society in February 1931 occupies five pages of the *Journal* (vol. 78, p. 48) and consists mainly of criticisms of the classification. It was necessary to devise one that differentiated the salient types of utilization of the land and yet was simple enough to be used by school children and boy scouts in a relatively rapid survey, without serious errors arising from their lack of experience or mental equipment. The one adopted is as satisfactory as a compromise can be. The apparent refinements adopted in the later maps are of doubtful value, and it is to be hoped that no radical alterations will be made in forthcoming issues without very good reason, as such would detract from the value of the uniformity of a classification which should be standard throughout the series.

A. A. M.

REVIEWS

EUROPE

WATERMILLS AND WINDMILLS: A Historical Survey of their Rise, Decline, and Fall as portrayed by those of Kent. By WILLIAM COLES FINCH. *London: The C. W. Daniel Company* 1933. 10×7 *inches; 336 pages; illustrations and maps.* 15*s*

In these days of imported breadstuffs and of steam roller-mills located about the great seaports the windmill is a rare and picturesque survival. Mr. Finch's book however, with the aid of a large number of excellent photographs, takes us back to the earlier conditions of milling as they are revealed by a survey of the mills of Kent. He has been at pains to collect, alike from books, from direct observation, and from old inhabitants, a great deal of information about the types of windmills and the practice of milling in the past. Very little space in proportion is given to watermills. Mr. Finch reproduces a list of the 351 mills recorded in Domesday Book; he is puzzled, as others have been puzzled, as to where and how they were located, and it would have been helpful if he had attempted to map their distribution. The geographer will be most interested in the distribution maps, one of which (p. 32) shows that the 136 watermills still standing between the years 1819–43 were located almost entirely within the Wealden area of Kent, while another (p. 139) shows how the windmills standing at the same time—there were 239 of them—were particularly concentrated in east Kent and along the loam belt at the foot of the Downs.

The book is lightly and discursively written; it aims to be descriptive, pictorial, and anecdotal; and one-half of it consists of historical accounts of the windmills of Kentish villages and towns which are separately listed. The more serious reader will however feel a certain dissatisfaction inasmuch as the many problems on which a study of old mills might throw light are scarcely touched upon. Thus one is not told much about the partial disappearance of watermills subsequently to the introduction of the windmill in the twelfth century, and about the possible relation of this to changes in water-supply. Nor does one learn much as to the varieties and proportions of cereals grown and milled in Kent, a matter of some interest in relation to the thesis of the late Sir W. J. Ashley that rye was the breadstuff of the English people. It would have been of interest to know whether this was true under the optimum conditions of wheat growing provided in Kent, but Mr. Finch tells us nothing about this.

W. G. E.

WONDERFUL LONDON TO-DAY. By JAMES A. JONES. *London: John Long* 1934. 8½×5½ *inches; 352 pages; illustrations* (*Drawings by* LUNT ROBERTS). 10*s* 6*d*

This book is hardly geography, unless it can just squeeze into the human geography shelf; even so it is only one part of geography to ninety-nine of humanity. But it is fairly safe to predict that it will prove to be one of the most popular in the Society's Library. It consists of some five and forty studies of London life that have appeared in the *Evening News*, charmingly illustrated by numerous clever sketches from life by Mr. Lunt Roberts and also by a score of photographs —without margins in the latest style, which however is not very successful when there are two or more on a page. There can be few lifelong Londoners who will not find here something that they did not know before. There are many odd corners, queer trades, and eccentric figures, all described with a delightful touch reminiscent of Mr. H. V. Morton. Perhaps the most fascinating and most geo-

graphical studies are those connected with the river. But many of the more familiar aspects of London life are included, though there are notable omissions, such as scenes in a newspaper office or in a great hospital. We shall certainly look forward to another volume from this author and this illustrator. J. H. R.

A DESCRIPTIVE LIST OF THE PRINTED MAPS OF YORKSHIRE and its Ridings. (Yorkshire Archaeological Society, Record Series, vol. lxxxvi.) Edited by HAROLD WHITAKER. *Leeds: Printed for the Society* 1933. 9×5½ *inches;* xiv+262 *pages; illustrations.* 21*s*

The growing series of systematic catalogues of English County Maps has received a welcome addition in the present work, dealing with the largest county of all, which with its three Ridings, each needing consideration, presents an unusually formidable task to the compiler. Mr. Whitaker however, a resident in the county interested in archaeological research, has approached the task with enthusiasm, and the result is a catalogue second to none in accuracy and completeness. It is in fact more complete than some, which have stopped at A.D. 1800, and the inclusion of the nineteenth-century—lacking the historical interest of earlier periods—must have added to the irksomeness of the task, at the same time more than doubling the size of the book.

In the general arrangement, and even in the choice of type, Mr. Whitaker has closely followed the pattern set by Mr. Chubb in his similar catalogues. The maps are grouped by year of publication, and the title of each is given first in heavy type, followed by a statement of source in small capitals, and this by the descriptive matter in ordinary type. One useful addition is the series of running numbers given to the separate entries, and the reference is to these and not to pages in the tabulated catalogue of authors at the end. Another small improvement would have been acceptable—a mention of the authors' names at the head of the entries, in a position better calculated to catch the eye. As it is, the name has sometimes to be sought for in a title running to several lines, all in the same type.

In a brief introduction Mr. Whitaker sketches the general progress of Yorkshire cartography from its beginnings in more general maps, such as those of Münster, Lily, and Mercator, sections of whose maps are reproduced. He then comes to the County Maps proper, introduced by Saxton's, and gives a useful commentary on each, mentioning any special character which may give special value or otherwise to it; for instance the curious error in longitude shown by some maps even of the mid-eighteenth century. He has done a service by attempting to unravel the problem of successive issues of the same map (or copies of it by others) over long periods, which brings out well the long life, so to speak, of the productions of Saxton, Speed, Blaeu, Jansson, and many others. Of late reissues of Saxton he is careful to distinguish two for which Lea was responsible, assigned to 1689 and 1699, whereas a single date of 1690 is commonly given by guess-work. He does not however discuss the problem of a possible issue between that of Web, 1645, and Lea's first. In the early modern period due praise is given to Warburton's big map of 1720—a scarce item which the Society unfortunately does not possess—and to Jefferys' finely engraved map of 1771–72, in twenty plates, based on an entirely new survey, which was the basis of most succeeding maps to the time of the Ordnance Survey.

An instance of the comprehensive character of the work is the inclusion of the "Yorkshire," which must have formed one of the "playing-card" series of 1590, partly reproduced in the Society's recent issue of facsimiles. (The probable title has to be supplied by analogy.) As regards Mercator's map of 1564 Mr. Whitaker will no doubt be glad to learn that a second copy was discovered in

Italy a few years ago (*Geogr. J.*, vol. 62, p. 33), the only one known to him being that at Breslau. An interesting point raised is that of the possible existence of two engravers named Peter Keer (Van den Keere or Kaerius), deduced from the presence so late as 1657 of a "Yorkshire" bearing that signature in Jansson's 'Atlas Minor.' It is true that the well-known bearer of the name would then have been eighty years old, but may it not be the case of a late use of an old plate? This map was used so late as 1729 in the 'Galérie Agréable du Monde,' with some additions in French, this being the only instance known to the author of a map of Yorkshire with any language but Latin or English.

These are only a few of the many points of interest in the book, which is illustrated by twenty-three excellent facsimiles. It is a solid piece of work, on the successful completion of which Mr. Whitaker may be warmly congratulated.

E. H.

SCOTLAND THROUGH FRENCH EYES. By PAULE HENRY-BORDEAUX. Translated from the French by Mrs. HAROLD SANDWITH. *London: Methuen & Co.* 1934. $7\frac{1}{2} \times 5$ *inches;* viii+214 *pages; illustrations.* 7*s* 6*d*

"Wilder and wilder rocks . . . a violet heather moor of such melancholy that I felt like screaming . . . this rotten, water-logged soil in which nothing will grow . . . gaunt red-faced spinsters are drinking whisky, that is as rough as a rasp, out of beer mugs . . . 'midges,' terrible insects, smaller than lice and crueller than mosquitoes." But this is the Highlands, and the Lowlands hold better things, Edinburgh having more the air of a capital than London. None the less one feels that the original French title, "*Fantômes d'Écosse*," was more appropriate than the English version, for without Burns, Sir Walter Scott, Mary of Lorraine, and Mary Stuart the author would have had difficulty in filling out her pages. It is indeed the younger Mary who gives the book what unity it possesses, for it includes an account of a pilgrimage to the castles and other sites associated with her life in Scotland and ends at that Solway beach where she left for England. The major interest being thus historical and romantic it is unreasonable to complain that geography is completely ignored; but the fact seems to render a fuller notice here needless.

M. I. N.

WHERE THE MISTRAL BLOWS: Impressions of Provence. By SUSANNE R. DAY. *London: Methuen & Co.* 1933. $7\frac{1}{2} \times 5$ *inches;* viii+316 *pages; illustrations.* 8*s* 6*d*

Many volumes have been written about Provence, and it is inevitable that a new writer should cover much well-worn ground. The authoress of this book, who writes graphically and sometimes amusingly, at least has the merit of visiting places on foot and of trying to enter into the lives of the people both at home and at market, at work and at play. She has a good deal to say about the most unlovely feature of Provençal life, the *corrida* or bull-fight. This appears to be a completely Spanish business, imported only a hundred years ago, and to be displeasing not only to a large section of the people but also to the Government; but the promoters and the "fans" shout down the opposition and cheerfully submit to the fines and extra entertainment taxes imposed by Paris. A very different affair is the native *course des razateurs*, a comparatively harmless sport with bulls from the Camarguais *manades* (herds). We are told of the *ferrade* or branding of the calves, a popular event in the Camargue attended by throngs of spectators, including Arlésiennes in their pretty but unhappily obsolescent costumes, who ride out *en croupe* behind their swains. Arles is evidently the Provençal town most favoured by the authoress, who devotes many pages to its past history and present condition. To her Nîmes is "bourgeoise to the core," and lacks "the spiritual grace of Arles." Some sort of sketch-map is wanted to save readers

getting out an atlas; and it is unfortunate that illustrations in books always present the dullest, flattest view of the Pont du Gard, giving no conception of its vast size and little of the exceptional picturesqueness of its setting. J. H. R.

ASIA

ON HILL AND PLAIN. By LORD HARDINGE OF PENSHURST. *London: John Murray* 1933. 8×5 *inches;* xii+110 *pages; illustrations.* 7*s* 6*d*

Almost every Englishman in India, whatever his rank or station, expects his turn of *shikar* to mitigate the trials of existence, and he usually gets it in one form and another; but few enjoy such opportunities for the diversion as are presented to a Viceroy when he is the guest of Maharajas. In this book of Indian sporting recollections Lord Hardinge shows how fully he took advantage of those opportunities during his Viceroyalty, delighting the hearts and winning the lifelong regard of his princely hosts by the skill and courage he displayed in fields of sport no less than in his official activities.

Most of the fourteen short chapters that make up the book deal with sport in the grand oriental manner, with troops of elephants and infantry battalions for beaters, daily bags of small game by the thousand, stags by the dozen, and tigers eight at a time, and every possible arrangement for the comfort and safety of the noble sportsman. But other incidents are recorded that called for personal vigilance, daring, and endurance; such as a single-handed affair with a 6-foot bear, a three-days' stalk in the Kashmir Mountains for Barrasingh and sundry encounters with pig in which, on at least one occasion, the pig nearly got the best of it.

Naturally a good deal of space is devoted to tiger shooting, which the author calls "the sport of kings and of tin gods such as Viceroys," but about the best chapter is that on three weeks of varied sport in Kashmir. A few pages on earlier sporting days in Persia, where the author, while British Chargé d'Affaires at Tehran, shot ibex, coursed hares, and learnt to eat poached eggs in his fingers, comes as a sort of appendix to a diverting little volume. The illustrations are in the style usual to books of the sort, many of them depicting the triumphant sportsman armed with gun, spear, or rod, with his victim prone before him.

W. A. G.

PALESTINE. By NORMAN BENTWICH. (The Modern World. Edited by the Rt. Hon. H. A. L. FISHER.) *London: Ernest Benn* 1934. 8½×5½ *inches;* 302 *pages.* 21*s*

The purport of the series to which this volume belongs is "a survey of historical forces," and consequently this account of Palestine is not concerned with geographical or historical details but mainly with the immediate past and the future of the Holy Land. Since it comes from the pen of the learned Professor of International Relationships at the Hebrew University in Jerusalem, who has already written extensively on the subject, it is inevitable that Zionism should take a dominant part as an "historical force." Much that is written here has appeared in other words in the author's book 'England in Palestine,' published three years ago. To the non-Hebrew the volume will seem to overstress the Zionist attitude so that it appears as an instrument of propaganda. For this we cannot blame the writer, but his attitude inevitably leaves an impression of bias.

The chapter on Economic Development tells of very remarkable facts and might well have been extended. Transjordania presents again a most perplexing problem. "Economically Palestine and Transjordania are one connected region." This is true, but the Balfour Declaration and all that has followed

from it makes it improbable that the two regions will march in unison till the "primary condition for the development of a happy and prosperous Palestine" is fulfilled, namely "that both Arabs and Jews should acquire consciousness of belonging to a country in which the two nationalities are interdependent and that they should co-operate with each other." All who wish well for the future of Palestine must wait for the coming of that day. It is delayed by different languages, a different religion, and different economic standards. The Zionist looks to the West from which his money and his new recruits steadily arrive. These latter come with their Western standards, customs, and clothing, and proceed to acquire a language which is not understood outside their race: the Arab looks to the East and South, where one language, one dominant religion, and one economic outlook is common to millions of his race. "The Jews are the natural intermediaries between East and West" is here repeated, but it seems that in modern Palestine another intermediary is badly needed to keep these two, at present, antagonistic and suspicious elements from coming to open clash.

Those who would realize something of this problem and also of much that is new and greatly encouraging in the rapid economic progress of Palestine are confidently recommended to read this well-written book. E. W. G. M.

AFRICA

INLAND WATERS OF AFRICA: The Result of Two Expeditions to the Great Lakes of Kenya and Uganda, with Accounts of their Biology, Native Tribes, and Development. By S. and E. B. WORTHINGTON. *London: Macmillan and Co.* 1933. 9×6 *inches;* xx+260 *pages; illustrations and maps.* 15*s*

The centre of Africa is being opened up by motors and aeroplanes with such rapidity that the results of our authors' two expeditions to the Great Lakes of Kenya and Uganda, undertaken in 1928 and 1931, are likely to become classical. They were accompanied by a trained geologist (V. E. Fuchs), and by a naturalist (L. C. Beadle), who had gained invaluable experience in the swamps of the Grand Chaco, which also has its own lung fish (*Lepidosiren*) and a fauna with peculiar adaptations to modes of life, to which analogies may often be found in areas of Central Africa. In his first expedition Dr. Worthington assisted Michael Graham in his attack on the fishery problems of the mighty Victoria Nyanza, before he proceeded to his own work on Lakes Albert and Kioga. In this expedition he often had the companionship of Mr. R. E. Dent, formerly a planter, and later the very active fish warden of Kenya. There is a breadth of knowledge here to help our authors in their work, for which they made the ideal combination of naturalist and geographer. It must have been a sore trial for a very young geographer to have the responsibility of the survey of Lake Rudolf thrust upon her, but how well Mrs. Worthington responded is seen in the book before us as well as in her husband's lecture before the Society (*Geogr. J.*, vol. 79, p. 275). Both authors are young, but their observations are those of talented and already experienced naturalists, not traveller's notes. In telling their story they never hedge while endeavouring to explain the reasons for the many curious facts and conditions that they have discovered. Doubtless some of their conclusions will prove to be erroneous, but their facts are well substantiated and made interesting by theory. Sixteen lakes in all were investigated in Kenya and Uganda, and these comprise all the lakes of the two colonies. They are situated in the two rift valleys of Albert and Rudolf, which to the south converge in Nyasa, and in the uplands around Victoria. The rifts are recent, and it is a land of recent and still active volcanic activity. It is a land where there has been long-continued

topographical adjustment, perhaps most active within man's period on the Earth. Parts have been subjected to glaciations and the whole to wet and dry periods, which have profoundly altered its life.

To Lake Rudolf is naturally assigned pride of place, and the account of it in the *Journal* is amplified. The story of the journey by car, with a lorry carrying the boat, gives an excellent idea of the country and of the difficulties of the region. Crocodile island in the centre, with its crater lakes for the first time visited by man, is vividly described. It brings home to us that the floor of a rift is a line of weakness in the Earth's crust, and in this part there is evidence of much recent disturbance. Lake Rudolf was crossed on two lines, and its shores on either side between these lines explored. They are steep to the east and low and flat to the west, and old beaches at 475 feet indicate the fall of the waters, which converted Rudolf into a lake at lower level than its Nile outlet, a pool for the concentration of soda. It is a pity that the depth sections could not be carried across the lake owing to the stress of weather, but there is enough information to assure us that the sections are about the same as those of Lake Edward, subsequently described, but reversed, the steep escarpment to the east and more gradual slope to the west. The east shore was almost inconceivably lonely with no inhabitants other than the baboons, giraffes, zebras, and antelopes with their attendant carnivores. This country therefore suggests itself as an area to be proclaimed as a game reserve.

We are next taken to the far west Uganda to Lakes Edward and George with their large connecting Kazinga channel. Here we are under the cloud-capped Ruwenzori (16,794 feet), "a mass of ancient rock which was left high when the country round dropped," perhaps even pushed up somewhat. Man has only scattered settlements near Edward and George, but there is a good roadway from Mbarara. The authors were fascinated by the "work of lowering thermometers and hauling up animal life" and the stories which could be gleaned therefrom. Their results here are seen in an excellently contoured plan of Edward, its deep waters on the west side of its rift attaining a depth of 63 fathoms. The importance of a sudden fall in the water temperature at a depth of 25 fathoms, the thermocline, is shown, and this must profoundly affect the life. Much of the shore, especially of George, was papyrus covered, succeeded by tree and liane swamps leading to more sparsely treed park lands, the true game home into which the elephant and buffalo only wander at night. The hippopotami revelled in the water's edge, and there are no crocodiles here, since they never seem to have made their way up the rapids of the Semliki or through its dense bounding forests.

Lakes George and Kioga are shallow lakes which will become swamps and dry lands in turn when the Semliki river and the Nile at Murchison Falls have cut deeper their beds. They are in the lower country here, hot moist areas, papyrus-edged with floating islands, their waters teeming with fish life. George is contrasted with Bunyoni to the south at 6500 feet. Here a great deep-cut valley with its tributaries has been dammed up by recent lava flows, giving a lake some 20 fathoms deep. The country is open, the appearance that of temperate lands, the waters relatively cold and edged by water lilies.

The food chain differs in each lake, and those of Albert, Victoria, and Bunyoni are depicted. The fishermen and their craft proved interesting and the illustrations throughout combine scientific suitability with beauty. No part of the world can escape the present "age of man" and all that it implies—and, if these regions are ever made healthy, all these waters will be farmed to help in the feeding of man. It is a pity that this must be, but our authors have done us good service in putting on record the animals, plants, and conditions in these inland waters

before man commenced to operate. Such investigations will also teach the "farmers" of the water how to use the existing life without useless and wasteful destruction. J. S. G.

TWENTY WEST AFRICAN TIMBER TREES. By L. CHALK, J. BURTT DAVY, H. E. DESCH, A. C. HOYLE. (Forest Trees and Timbers of the British Empire. II.) *Oxford: Clarendon Press* 1933. $9\frac{1}{2} \times 6$ *inches;* 108 *pages; illustrations.* 7*s* 6*d*

This volume is a continuation of a series issued from the Imperial Forestry Institute, Oxford, the first part of which was noticed in this *Journal*, vol. 80, p. 75. The same plan is followed as in the previous number, each of the twenty trees being fully treated under the headings Common Names, Vernacular Names, General Description, Botanic Description, Distribution, Uses, and Description of Wood. In this last section the general properties and macroscopic and microscopic features are described in detail, and accompanying each species there is a line drawing with dissections and a plate illustrating the habit of the whole tree and tangential and transverse sections of the wood. The publication of this admirably prepared series comes at a very opportune time, when Empire timbers are becoming of increasing importance. It is gratifying to see, from the ready co-operation of the officers of the Forestry Departments of the West African Colonies concerned, that the importance of accurate botanical identification and description of timber trees is fully appreciated by the practical forester. It is to be hoped that further volumes in this series will follow at regular intervals. J. S. L. G.

THE BIRDS OF TROPICAL WEST AFRICA, with Special Reference to those of the Gambia, Sierra Leone, the Gold Coast, and Nigeria. By DAVID ARMITAGE BANNERMAN. [In Six Volumes] Volume III. *London: The Crown Agents for the Colonies* 1933. $10\frac{1}{2} \times 7$ *inches;* xxxvi + 488 *pages; illustrations and map.* 22*s* 6*d*

The third volume of Mr. David Bannerman's 'Birds of Tropical West Africa' equals in every way the first two in maintaining the very high standard which the author has set himself and which modern research work demands. This volume covers Orders XIV to XXIII (Owls to Wrynecks) and completes the non-passerine birds. The illustrations, which comprise twelve coloured plates and one hundred and forty-two black-and-white figures, are well chosen and should help the field naturalist in identification. Not least valuable is the careful compilation of all available field notes on habitat, habits, and food.

There is an excellent War Office map of Sierra Leone, but we hope that Mr. Bannerman will see his way to publishing with his last volume a map giving all the place-names mentioned in his completed work, for these are often impossible to find on general maps. The value of such a map to ornithologists and others cannot be overestimated. No doubt Mr. Bannerman will also publish an appendix listing those birds which have been recorded from West Africa since the publication of the volumes, such as the Hottentot Teal, the Ferruginous Duck, and the Gadwall. The attitude of the lower figure on Plate 10 and Fig. 1 on Plate 12 is not altogether characteristic, and the comparative table on p. 252 would have been better placed immediately following the Key on p. 242.

This work, together with several others already published or in preparation, suggests that the systematic side of African ornithology is drawing to a close; and this is satisfactory, for it not only points to our present considerable knowledge, but opens up the way for other branches of study which were not possible without the groundwork of the systematist. But that there is still work

of real scientific value for the latter is exemplified by the new arrangement of *Cuculus solitarius* and the *Cuculus clamosus* group. Such well-thought-out re-grouping is one example of Mr. Bannerman's careful zoogeographical research work. C. H. B. G.

CECIL RHODES. By (Sir) HERBERT BAKER. *Oxford: University Press* 1934. 9×5½ *inches;* xvi+182 *pages; illustrations.* 10*s* 6*d*

The writer of this review recalls well how in the years between the Jameson Raid and the end of the Boer War, while very many people said hard things of Rhodes and attributed to him low aims, young men who had come under his influence had enthusiasm for his character and belief in his ideals. Such a one is seen from this book to have been Herbert Baker, who was associated with Rhodes as his architect and his friend from 1892 for the ten years that remained of his life. In the earlier of these years Rhodes was Prime Minister of South Africa and Managing Director of the Chartered Company. He was pacifying Matabeleland and organizing its administration and he was working in diverse, and some said devious, ways for a united South Africa. Then came the Johannesburg plot and the Jameson Raid. After this Rhodes, no longer Prime Minister, carried out various practical schemes for the development of Rhodesia and secured a peace with the Matabele that this time lasted. He conceived and worked on a great project for uniting by railway and telegraph the Cape to Cairo. He was shut up in Kimberley in the early part of the Boer War, and during its later phases was planning to play a leading part in the reconstruction which would take place when peace should come again.

It is not on this well-known story that Baker enlarges, but on another aspect of his hero's life. He tells us how a natural love of beauty, possibly awakened by a Ruskin lecture, survived the unpropitious conditions of early life and led Rhodes to spend some of the vast fortune then acquired in beautifying the land he had adopted, and of how he utilized the resources of that land in materials and craftsmanship in the buildings that under guidance he designed to fit its climatic and scenic conditions. In telling of the circumstances and the generous purpose of each building Baker illustrates for us Rhodes's doctrine of ransom which led him to make a sharp distinction between the men who used riches for their own gratification and those who spent their money for the good of the land where they had made it. Baker also tells of some fantastic plans which, fortunately, did not come to execution, of the foible of size which it must at times have been difficult to restrain, and of Rhodes's carelessness in expenditure until near the end of his life, when his mind became filled with the desire to make of noble proportions his posthumous gift to Anglo-Saxon culture—that of his Oxford Scholarships.

Something is told us also of Rhodes's affection, amounting nearly to worship, for Table Mountain and the views of and from it; of his love of Cape homesteads and his efforts for their preservation; of the fruit farming and other forms of agriculture of which he stimulated the development in Cape Colony; of his attitude towards native races and half-castes; of his generosity towards opponents and of his reaction to the imperial factor. There is much about his personality and character, the effect of which on Baker is thus stated: "Amongst the great men I was privileged to know and work for in South Africa, Cecil Rhodes stands out pre-eminently as a personality compelling the highest service and inspiring hero-worship. He carried you with him above the material and the critical into the higher sphere of his own practical idealism."

The weaknesses of the book are those put down by the author to his being an artist—a tendency to crowd ideas into the page and to allow quotations to creep

into the design. It is scarcely a book specially to recommend to geographers, for there is nothing geographical about it except in so far as it gives insight into the thoughts of a great man who greatly influenced the political geography of a continent. This it does well. M. N.

ESSAI SUR L'ÉVOLUTION DU RELIEF DANS LA RÉGION Prérifaine (Maroc Occidental). By JEAN DRESCH. (Publications de l'Institut des Hautes-Etudes Marocaines, Tome XXVI.) *Paris: Larose* 1933. $9\frac{1}{2} \times 7\frac{1}{2}$ *inches; 156 pages; illustrations and maps. 35 fr*

The area described in this book lies in the depression between the Rif and the Middle Atlas. It extends from the Wadi Beht, some 20 miles west of Meknes, to Fez, and from the border of the Middle Atlas on the south to the Sbu on the north. There is a useful summary of the climate and hydrography, but the greater part of the volume is devoted to the relief of the region. The plateau of Meknes and Fez is bounded on the south by a nearly continuous cliff of Jurassic limestone resting undisturbed on a basement of older rock; on the north is a less continuous line of hills which owe their origin to folding of Mesozoic and Tertiary age. The plateau itself is for the most part covered by lacustrine deposits which may belong to the Pliocene period; and there have been earth-movements since these were laid down. The whole plateau has been tilted to the north and there are important flexures in it.

The sea left the area about the close of the Miocene period. The plateau then became a lake or lagoon hemmed in between the Jurassic cliff on the south and the folded ridges on the north; and the present rivers arose. There is evidence that the subsequent elevation to the present height was not continuous, but took place in steps. Base-levels are indicated at 500, 200, and 100 metres. Perhaps the most interesting sections of the book are those dealing with these matters; but attention should also be directed to the description of erosion forms in a hill made of salt.

The book is illustrated by photographs, sketches, geological sections, block diagrams, and sketch-maps. The photographs are not always clear; but the other illustrations, though rather roughly drawn, are perfectly clear and show what they are meant to show. P. L.

AUSTRALASIA AND PACIFIC

MODERN SAMOA: its Government and Changing Life. By FELIX M. KEESING. *London: George Allen and Unwin* 1934. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 506 pages; sketch-maps. 16s*

This book scarcely touches on the beauty and romance which the very name of Samoa brings to the mind of the ordinary reader. It says little or nothing about the natural features of the islands, the wonders of their tropical vegetation, and the charm that many have seen in their dark-skinned inhabitants. Nor are there any adventitious aids to the perusal of 500 pages of fairly solid matter; these are enlivened by no illustrations, and five outline diagrams take the place of the attractive maps for which one might look. Nevertheless this little-adorned and essentially practical work is full of interest and of high value, inasmuch as the tiny islands of the Pacific, of which it so truly tells, present in a concentrated form most of the problems that have had and have to be solved by European administration in the tropics, and their known history covers the time through which these problems have taken on new forms owing to changing moral and economic outlooks.

Samoa is a group of islands and islets in the middle of the Pacific, more than

1500 miles from the nearest considerable land-mass. The whole area of the group is about eight times that of the Isle of Wight, and the total population about half that of the same island. The two larger islands constituting Western Samoa are about fifteen times the size of the small one and of the group of islets to the east which together now make American Samoa. The whole group, occasionally visited by European navigators in the eighteenth century, was practically left to its own resources till the middle of the nineteenth. The quarrels of native chiefs aiming at enhanced prestige and the intervention of European Powers desiring increased trade and influence led up to the joint control by Britain, Germany, and the United States from 1889 onwards. From this control Great Britain retired in 1900 and the group was divided, Germany taking the larger Western and the United States the small Eastern islands. On the outbreak of the European War New Zealand, at the request of Great Britain, occupied Western Samoa, and in 1919 she accepted from Great Britain a mandated government over these territories.

The problems that have come before the various Powers, in their attempts to maintain order in and to develop Samoa have been, briefly, to create a central authority—administrative and legislative—that could make use of and satisfy or else replace the sectional chiefs, and generally to utilize and adapt Samoan organizations and customs to secure progress in the islands in accordance with Western ideas, and especially to introduce the incentive to production of individualism without sacrificing the valuable co-operative spirit that came from communalism. None of the Powers that in the last fifty years have dominated Samoa have been entirely or even largely successful in solving these problems. Their jealousy of one another at the time of the joint occupation was fatal to this. Later Germany, with a greater element of force in its endeavours, went further, but had probably reached a climax of its success when the task was taken over by New Zealand. The efforts of that dominion have been somewhat hampered by the mandatory system, intended to work primarily for the advantage of the native population, under which it has operated with honest purpose. The United States, in dealing with American Samoa, have doubtless derived some advantage from a long consecutive application of their methods to the problem on a somewhat smaller scale.

The methods and the results achieved by the various Powers, both in their general administration, in their efforts to direct native economic life, and in the work of the various departments of justice and public order, land regulation, public health, and education, are examined by the author in considerable detail and with noteworthy impartiality. He puts before the reader the views of the official and non-official European, the missionary and the trader, as well as the reaction of the Samoan to the attempts that have been made to guide his life in the direction of Western culture with its regularity and sustained effort and so away from Samoan custom marked by inertia and pleasant leisure. Sometimes the author's freedom from bias is carried to an extent that makes it difficult to balance between the opposing views he so clearly and fully sets forth and so to grasp the conclusions at which he would have one arrive. He makes it clear however that under the altered conditions the old native life of Samoa could not escape modification in the past and will necessarily be further modified in the future; that the business of the protecting Power is to ensure that the old sanctions should not be destroyed and the old ties loosened before new sanctions and new ties are accepted; and that it is also their business to see that these sanctions and ties may be such that the development of the Samoan people will best fit them for inevitably closer contact with the rest of the world.

The author faces the fact that blood mixture, already considerable in Samoa,

will increase there as it is doing in other islands of the Pacific, and that the inhabitants of Polynesia are tending to become a new mixed race in which however the original blood with its accompanying fine physique and by no means inferior mentality will maintain itself. He is very definite in his opinion that the attempts to check miscegenation between Samoans and Chinese will have little effect, and that no gain would result from their being successful. He lays stress on the importance of the growing part-Samoan element of the population. He devotes much attention to the extent to which the difficulties that the present Government has experienced have arisen from dissatisfaction of the non-official Europeans with the subordination of their interests to those of the Samoans; he seems to hold these white men not entirely free from the reproach of making use of Samoan discontent to give expression to their own. It may however be deduced from the general tenor of his criticisms that he holds the main source of the difficulties of late years to have been attempts to move too quickly in the direction of supplanting the indigenous with Western culture, even though the former was often adhered to in form. To this he attributes the Mau or non-co-operative and self-governing movement started in 1926 to express native dissatisfaction. He refers to this being checked by the somewhat strong measures taken in 1929, but is extremely pessimistic as to its early disappearance, a pessimism that recent notices in the English papers on the subject of the trial of the Mau leader, Olaf F. Nelson, have shown to be justified. Our author deplores "the lack of anything approaching touch between the authorities and the Samoan people"; he thinks the Mau worthy of deep study, and "if such a study were launched the opportunity might arise for a transformation of the Mau into a co-operative rather than a seditious movement."

The book is written in clear English, though here and there words are used in a sense that would be more familiar in the Antipodes than in this country. There is a sufficient bibliography, a satisfactory index, and a glossary in which are to be found all the Samoan words in the text that are not translated in the places where they occur. M. N.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

THE ATLANTEAN CONTINENT: its Bearing upon the Great Ice Age and the Distribution of Species. By H. EDWARD FORREST. *London: H. F. and G. Witherby* 1933. 9×5½ *inches;* 328 *pages; illustrations and map.* 10*s* 6*d*

The author of this book says that he is a zoologist, not a geologist, and in seeking to explain the difference between the Irish and the English faunas he was led to the conclusion that there was formerly a continent connecting Europe with North America; and he seems to think that this idea is new. It is old, but his method of proof and his subsequent deductions are new.

The Bermudas stand upon a submarine hill which rises some 12,000 feet from the floor of the Atlantic. The author states, mistakenly, that the islands consist entirely of coral rock. Therefore, according to him, the whole hill upon which they stand was built by corals, and this is indisputable proof that the bed of the Atlantic has sunk 12,000 feet in Quaternary times. He anticipates incredulity amongst geologists, but even those who are not geologists may feel some doubts about this reasoning. The edge of the continental shelf is a line of fault, and the continents did not share in the subsidence; but, though there is a well-marked shelf round Iceland, that island fell with the ocean floor.

To restore the conditions before the subsidence the author raises the bed of the Atlantic about 12,000 feet. The northern part becomes a great stretch of land uniting Europe and America, and Iceland becomes a mountain mass rising

to a height of 17,000 feet. During the Glacial period this northern land was covered by an ice-sheet flowing out from Iceland as a centre. He recognizes that the Scandinavian rocks found in the English boulder-clay could not be brought by a radial flow from Iceland. Therefore he supposes that after a time the Scandinavian peninsula was raised and the flow deflected. It must have been a rather remarkable deflection to allow such an ice-sheet to pick up larvikite at the mouth of the Oslo fjord and set it down on the coast of Yorkshire.

Though he is not a geologist the author does not hesitate to instruct geologists in geology. If their observations and interpretations fit his views, he quotes them at length. If they do not, they are wrong. He corrects the Scandinavian geologists about the Yoldia Sea and the oscillations of level. He does not profess that he has personally examined the evidence that they so patiently accumulated, and it is clear that he has not read their papers. But he has read the summary of their results in Wright's 'Quaternary Ice Age,' published twenty years ago. It is an excellent summary and it occupies thirty-six pages. What more is needed to place the author on the same footing as Brögger, De Geer, and Sederholm as an exponent of the late Glacial history of Scandinavia and Finland? This is a characteristic example of his method. But the fate of the Atlantean continent does not depend upon this volume. P. L.

ECONOMIC AND HISTORICAL GEOGRAPHY

A HISTORY OF EXPLORATION, from the Earliest Times to the Present Day. By Brigadier-General Sir PERCY SYKES. *London: George Routledge & Sons* 1934. 10×6 *inches;* xiv+374 *pages; illustrations and maps.* 25*s*

The general reader at the present time has acquired a taste for biography and history which probably explains the popularity of books on explorers and travellers of all centuries. He should therefore warmly welcome so readable an introduction to the history of exploration as this by Sir Percy Sykes. It is clearly written, reasonably comprehensive, and enlivened with entertaining extracts and comments. After enjoying it, many readers should be attracted to the original narratives of those who have taken part in the unveiling of the Earth's surface, and in this they will be helped by the frequent bibliographical references. There are also numerous varied illustrations and many maps, most of them reproduced from Mr. J. N. L. Baker's 'History of Geographical Discovery and Exploration.'

The author has of necessity set well-defined limits to his task. A book of this scope could not refer to every explorer, or treat every country in full detail. He has aimed at including all names of importance, with, in addition, those whose adventures and narratives are more striking, and those who have appealed most to him. In his selection he has not interpreted the term "explorer" too narrowly: its content has varied from time to time, as the motives have. Conquest, trade, religion, and science, in combination with the adventurous spirit, have all impelled men to undertake the tasks he describes. In comparing their achievements the contemporary state of affairs must be remembered. The author, for example, has a high regard for Ibn Battuta's achievements, but, as a Muhammadan, he had far fewer obstacles to overcome in his journey, for example, to Timbuktu, than had the European explorers of the early nineteenth century.

The author's own experiences and predilections attract him to Persia and to Central Asia, so that the continent of Asia receives generous treatment. Arabia, for example, has three chapters, compared with one each allotted to Australasia and to the Arctic. The chapters on Asia are the best portion of the book, detailed, fully illustrated with quotations, and set in close relation with the historical background. Alexander the Great, Hsuan-tsang the Bhuddist pilgrim, Marco

Polo, and Ibn Battuta dominate these pages—and the recital of their names emphasizes the fact that the author has not adopted a narrowly European standpoint. The relations of China with the West are among the themes which receive more than passing mention. Outside Asia the immensity of the subject has somewhat handicapped the author, and the narrative loses some of its force and freshness. Some sections are little more than outlines, linking up the well-known names of explorers such as Cook, Mitchell, Livingstone, Scott, and Shackleton, yet a true perspective is preserved.

There are some omissions which may be pointed out. Francisco de Orellana, the first to descend the Amazon, deserves at least a mention, as also Major Laing, the first European in modern times to cross the Sahara to Timbuktu. The Russian explorer Vilkitski has a good claim, since he made the most considerable discovery of the twentieth century in the Arctic. The roll of modern travellers lacks the name of General Pereira. In one or two cases the achievements of travellers might have been assessed a little differently: the reference to Professor Gregory does not mention his work in East Africa, which was of considerable importance.

Drake is made to find refuge in islands south of Cape Horn (its rounding by the Dutch is not referred to); a chapter-heading states that Diaz circumnavigated Africa. It is perhaps a little misleading to state so precisely that Strabo reduced the width of the world "from 3750 to 2872 geographical miles," or that the Mount Everest Flight has produced a map of a large unexplored area. But such matters as these are not likely to trouble the general reader in his enjoyment of this stirring book. G. R. C.

DEN GAMLE HVALFANGST: Kapitler av dens Historie. By BJARNE AAGAARD. *Oslo: Gyldendal Norsk Forlag* 1933. 10×6½ *inches;* 166 *pages; illustrations and maps*

Although this is a popular book, it is obviously written by a master of the subject. Herr Aagaard begins with prehistoric times, showing whales from a drawing at Knossos and a rock-carving in Norway. The people of the north coast of Norway were killing whales at a very early date, and their descendants probably introduced the practice into Normandy and Ireland. The hardy Basques, whose bays were much frequented by "North Cape" whales from the twelfth to the fifteenth centuries, became expert whalers, and when, about 1450, whales became rare off the coast, the Basques followed them across the Atlantic and up to Ireland and Iceland. When whaling was taken up by the Dutch, Danes, and English—whales were numerous off the Kentish coast in the fifteenth century—Basque instructors and harpooners were employed. By 1620 Spitsbergen had become a centre for whaling fleets from Holland, England, Denmark, and Hamburg, and the discovery of multitudes of "right whales" in Davis Strait about 1720 attracted large Dutch fleets thither. During the seventeenth and most of the eighteenth centuries the Dutch were the foremost whalers of Europe, sending ships to all the northern waters from Spitsbergen to Greenland, and reaping large profits. The English, on whom Herr Aagaard is rather severe, practically gave up whaling after 1621, and not until about 1750 did the English Parliament, by large bounties and subsidies, succeed in reviving the industry. After that whaling was encouraged in part as a means of training men for the navy. The early backwardness of England was compensated by the enterprise of the colonists of Massachusetts, who after 1650 were very successful whalers, one of their chief centres being Martha's Vineyard. Boston was lit by spermaceti oil lamps while London was still largely in darkness. By the end of the eighteenth century most of the European nations had taken up whaling actively, and the Americans led

the way to the South Atlantic, and later into the Pacific, on the track of the spermaceti whale. The Norwegians, who had been first in the field, are now the foremost whalers of the world.

Herr Aagaard gives much interesting information about the development of the harpoon, the early blubber-melting stations on Spitsbergen, the equipment of ships after it became necessary to cut up the whales and boil the blubber at sea, the finance of whaling, and the number of subsidiary industries, such as sealing, shipbuilding, and sail-making, which it stimulated. There are many references to Herr Christensen's Whale Fishery Museum at Sandefjord. The author's knowledge of early works on the subject is exhaustive, and he includes a very useful bibliography. The reproductions of old engravings and maps, which number over a hundred, are extremely well chosen for an historical work which is as interesting as it is informative. E. L.

THE PORTUGUESE PIONEERS. By EDGAR PRESTAGE. (The Pioneer Histories. Edited by V. T. HARLOW and J. A. WILLIAMSON.) *London: A. and C. Black* 1933. 9×5½ *inches;* xiv+352 *pages; maps.* 15*s*

Professor Prestage, who holds the Camoens Chair of Portuguese Language, Literature, and History in the University of London, is well qualified to write a history of Portuguese exploration. As he points out, much new material on the early voyages has been collected in Portugal since Major's work appeared in 1868, and the book he has written is no mere précis of established knowledge, but breaks much new ground for English readers. It covers the whole period of Portuguese expansion from the voyage to the Canaries in 1341 to the first landing in Japan in 1542, and gives a serious, well-balanced account of this amazing episode in the world's history. How amazing an episode it was has never been adequately realized by historians who have thought in terms of European history and have measured the importance of extra-European events by the extent of their direct reactions on European affairs, a criterion which must tend to belittle the Portuguese achievement, because the effects of this vast exploring activity were not manifest on a grand scale until other nations had entered into the heritage of an exhausted Portugal. But the series of the Pioneer Histories aims, according to its editors, at "broad surveys of the great migrations of European peoples into the non-European continents, . . . abandoning a local for a universal perspective," and from this point of view is able to bring out the full significance of the effort whereby Portugal, in Major's words, "discovered half the world in the course of a century." That the phrase "half the world" is hardly an exaggeration can be seen from the world map which forms the frontispiece of this book and marks in red the range of Portuguese pioneering. In addition to the long groping round unknown Africa, which led at last to Vasco da Gama's voyage to India in 1498, and to the exploration of the islands and littorals of the "Indies" as far as Japan and New Guinea (through waters which were already sailed by Arab, Malay, and Chinese shipping, but had not hitherto been accessible to European), the Portuguese also opened up great stretches of coast in South America, where they established their colony of Brazil, and in North America, where the name of Labrador is now their only monument. Professor Prestage further discusses the Portuguese claim to the discovery of Australia, which is based on cartographical evidence of some weight, but he considers the case not proven.

By no means the least interesting of the chapters is the last, which deals with the nautical and cartographical science of the Portuguese and with the ships and seamen of the period of the great voyages. The author holds that the Portuguese themselves developed much of the science they required for their exploration,

and that they were not, except at the beginning, dependent on foreigners for their knowledge and technical skill, and he shows that, if this side of the Portuguese achievement has been less conspicuous to later ages than the actual voyages of the pioneers, it has been largely due to the deliberate policy, long pursued by the Portuguese Government, of suppressing information which might be of use to commercial rivals. Portugal was a small country with only a fraction of the resources of the new Spanish monarchy, and she sought to preserve her colonial monopolies as much by guile and secrecy as by force. The fears of her rulers were justified when Magellan deserted to the rival power, taking with him an equipment of specially Portuguese knowledge; the first circumnavigation of the globe was the achievement of a Portuguese, but it was made in the service of Spain. G. F. H.

THE CULTURE AND MARKETING OF TEA. By C. R. HARLER. *London: Humphrey Milford* (1933). $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+390 *pages; illustrations and sketch-maps.* 12*s* 6*d*

The author of this book was for a number of years scientific officer to the Indian Tea Association, a post which gave him ample opportunity for the study of all problems connected with the cultivation, manufacture, and marketing of tea. Some of the results of that study he has set down in this interesting and useful volume. If he is occasionally diffuse—the sections on geology are not always very pertinent to his subject, and his explanation of the Indian monsoon leaves something to be desired—ample compensation is to be found elsewhere, for Dr. Harler is an expert on his own subject and writes with authority. A considerable amount of space is naturally devoted to technical matters connected with the chemistry and pharmacology of tea, and the methods by which it is cultivated and manufactured, not only in India but in the East generally. Nevertheless there is much to interest and instruct the geographer, and especially the economic geographer, in the chapters which deal with each of the more important producing countries.

Of the tea plant there are many varieties. Lo-Yu, writing about A.D. 780, and quoted by Dr. Harler, said, "there are a thousand and ten thousand teas"—a pretty piece of poetic licence—but the real distinction is between the Indian plant and the Chinese one, the former with thin, large leaves which permit of rapid transpiration and enable it to grow in a hot and humid atmosphere, and the latter with small thick leaves which withstand cold and drought. The seasonal distribution of temperature and rainfall is also of importance; where the climate is very uniform throughout the year, as in Java, the quality is poor, as marked seasonal changes are apparently necessary for the production of well-flavoured teas. Dr. Harler also discusses soil conditions in considerable detail, and arrives at the conclusion that while tea will grow on any kind of soil it thrives best on light loams. Provided that the soil has had time to weather, its geological origin is not of great importance, and tea is grown alike on recent alluvium in north-east India, on the weathered products of Archaean rocks in south India and Ceylon, and on volcanic ash in Java.

The relative importance of the chief producing countries as regards both quantity and quality is also discussed; it is interesting to note in this connection that "an estimate putting the annual production [of China] between 600 and 800 million lb. may be taken as a first approximation." The Indian crop in 1931 was rather less than 400 million lb., but a much larger proportion of the Chinese crop is consumed at home. The same is true of Japan, where in the fifteenth century the ceremonial drinking of tea became "a cult founded on the adoration of the beautiful among the sordid facts of everyday existence." J. McF.

GENERAL

A DEMONSTRATION IN THE TEACHING OF GEOGRAPHY: An Account of the Staffordshire Geographical Exhibition. Edited by JASPER H. STEMBRIDGE. *Oxford: University Press* 1934. 9×5½ *inches;* 60 *pages; illustrations.* 1*s* 6*d*

This is an interesting account of an exhibition held in Stafford from 13–19 July 1933. It was an effort resulting from close co-operation amongst inspectors, teachers in all kinds of schools, and the L.E.A., and it was most successful. Its aim was to show the development of new methods in geographical work and teaching and to provide evidence of the interest which Geography can evoke in all types of people when they realize that it is the study of human relationships.

The book gives a list of exhibits and some account of their preparation and educational value. It is full of valuable hints for the teacher of Geography. It is to be hoped that other exhibitions of a similar type will be held in areas representative of different natural regions of England. A. B.

FIRST RUSSIA, THEN TIBET. By ROBERT BYRON. [*London*]: *Macmillan & Co.* 1933. 9½×6½ *inches;* xvi+328 *pages; illustrations.* 15*s*

'The Byzantine Achievement' and 'The Birth of Western Painting' have led us to expect writing of an extremely interesting, entertaining, and provocative kind from the pen of Mr. Robert Byron, and this beautifully illustrated book does not fall short of such expectation. As its title implies, it is made up of two separate travel narratives, one of Russia and the other of Tibet, and as its author declares in his preface, such unity as it has must be sought in the contrast of the themes. "The first part," he says, "is concerned with Russia, where the moral influence of the Industrial Revolution has found its grim apotheosis; the second with Tibet, the only country on earth where that influence is yet unknown."

According to Mr. Byron: "The tourist goes to Spain to see Spain, or to Italy to see Italy, but to Russia he goes to see Bolshevism. I went to Russia to see Russia." Actually, he has much to say about Bolshevism—and little to its credit. But his interests are primarily aesthetic and embrace the products of all periods of Russian history; he finds an essential Russia, "a permanent and impersonal factor, separable from time and politics" in "the consistently unique tradition of colour and form displayed by all the visual arts in Russia from the eleventh century onward." He never forgets that Russian civilization was originally Byzantine, and he is able to bring to the criticism of Russian art the full equipment of a Byzantinist, so that his Russian studies in this book form a worthy supplement to the important work he has done on the art of Athos and Mistra. Especially notable is his appreciation of Roublev's panel of the Trinity, now in the Tretyakov Gallery, Moscow, which he calls "the greatest masterpiece ever produced by a Slav painter." G. F. H.

The second part begins with the departure by the Air Mail from London, and we only reach the Tibetan border in the fourth chapter. The author went as the delegate of a newspaper in search of striking copy, and falls at once into the trivial personalities which he supposes the public to demand. He much exaggerates the difficulty of getting permission to go up the trade route to Gyantse, and he got no farther. He insists too much on discomforts which he might have avoided by taking a little advice; and he repays hospitality at Darjeeling by gibes at his hosts and their household. This second part, Tibet, is much inferior to the first, and unworthy of being its companion in a single volume.

THE MONTHLY RECORD

MEDALS AND AWARDS, 1934

His Majesty the King has been pleased to approve the award of the Royal Medals as follows: The *Founder's Medal* to Mr. Hugh Ruttledge, for his journeys in the Kumaon and Garhwal Himalaya extending over eight years, and his leadership of the Mount Everest Expedition 1933; the *Patron's Medal* to Captain Ejnar Mikkelsen, for his explorations in the Arctic between 1900 and 1912, and for his work in Eskimo resettlement on the East Coast of Greenland. The Council have awarded the *Victoria Medal* to Mr. Edward Heawood, for his eminence in the History of Geography and Cartography and his devoted service to the Society as its Librarian; the *Murchison Grant* to Mr. John Rymill, for his work in Greenland and leadership of the party after the death of Mr. H. G. Watkins on his second expedition; the *Back Grant* to Dr. D. N. Wadia, for his studies of the Himalayan axis and other problems of Indian geomorphology of importance to geographers; the *Cuthbert Peek Grant* to Mr. Edward Shackleton, to assist him in his proposed expedition to Ellesmere Land; the *Gill Memorial* to Mr. W. B. K. Shaw, for his explorations and studies in the Libyan Desert.

AWARD OF THE GEOGRAPHICAL ESSAY PRIZE

In the *Journal* for June 1933 it was announced that the Council of the Society had resolved to offer a prize of Ten Pounds annually for an Essay of not more than 5000 words: either a critical survey of recent additions to knowledge in a limited geographical field selected by the writer, or a discussion of some current problem in its geographical aspects. Competitors for the Prize must be registered Internal or External Students reading for Honours in Geography at one of the Universities of Great Britain and Northern Ireland during the academic year within which they submit their Essay. Essays must be submitted during the month of December, the award will be made not later than March 31, and the Prize Essay will be published in the *Geographical Journal* for May or June following.

Four Essays were submitted in December last, and the prize in this first competition has been awarded to Miss I. E. Muddle, student of the University of London, for an essay on "The Suitability of the Port of Dover as an Outlet for its Developing Hinterland." Essays in competition for the second award of the prize should be addressed to the Secretary of the Society by 31 December 1934.

COAST CHANGES IN ITALY

Special studies of certain parts of the Italian coasts, such as that of Professor L. de Marchi, noticed in the *Journal* for February 1931 (vol. 77, p. 201), have thrown some light on the changes of position to which the coast-line has been subject within recent years, the tendency being to show that there has been a general movement of retreat in many districts. It has been felt that co-ordinated research was desirable to elucidate the whole question, and a year ago action was taken by the Italian National Research Council, which referred the matter to the National Committee for Geography, while placing the direction of the inquiry in the hands of the Geographical Institute of Pisa University. A beginning has been made with study on the ground, and meanwhile a preliminary survey of the data already available has been made by Dr. Dina Albani and published at Rome by the National Committee as the basis for continued work. A brief introduction deals with general principles and methods, after which the ten major divisions of the Italian coasts, based on differences of form and character, are considered in turn, and the facts brought out concisely summarized. The want of precise

data for earlier periods has made it necessary to confine attention almost entirely to the period since 1800. At that date nearly all sections of the coast were showing an advance—some a marked advance; and though after this beginnings of a reverse movement made themselves felt on the Ligurian Riviera, an advance continued elsewhere, *e.g.* on the Tuscan littoral (with the mouth of the Tiber) as well as in Sicily and the Adriatic. After 1850 retreat took place not only in Liguria but here and there on the shores of the Tirrenian Sea, though hardly manifest for some time either in Sicily or in the Adriatic except at the mouth of the Po. Between 1870 and 1880 retreat became much more general, especially at the mouths of rivers like the Arno, Tiber, and Volturno, and in 1900 the proportion of the coast-line showing retreat, which in 1800 had stood at only some 7 per cent., had risen to 70 per cent. This has since fallen somewhat, thanks to measures of protection adopted. A final chapter discusses the possible causes of such fluctuations. The principal of these that have been suggested are littoral and tidal currents, wave-action modified by changes in the dominant winds (a cause put forward by De Marchi), slow movements of the crust, and a diminution of the amount of solid matter brought down by the rivers. Of these Dr. Albani is inclined to give most weight to the third, believing that the other causes, though possibly locally efficient, could hardly be responsible for the generally synchronous movement of retreat established for most of the coasts.

RAINFALL IN SOUTH-EAST EUROPE

A useful treatise by Dr. H. Renier, of Berlin, entitled "Die Niederschlagsverteilung in Südosteuropa," accompanied by maps, tables, and diagrams, has recently appeared (*Mém. Soc. Geogr. Beograd*, vol. i, 1933). The area studied is mainly the Balkan Peninsula, but leaves out part of Romania on the north and includes part of Hungary as well as the southern part of Italy. A large layer-colour map showing the distribution of mean annual rainfall is very useful, since it is impossible for the eye to confuse the tints.

The wettest region is the mountainous seaboard of the Adriatic and Ionian Sea; here Montenegro and a stretch of about 100 miles to the south of Fiume receive over 120 inches. This region appears to vie with the rainy mountain districts of Great Britain in amount of annual rainfall though it has fewer wet days. The driest regions with under 16 inches are at the mouth of the Danube and around Athens. There are three well-defined types of seasonal variation, each with modifications: the Mediterranean type, best developed in southern Greece, characterized by a maximum rainfall in December and a minimum in July and August; the Continental type, best shown in Romania but obtaining, slightly modified, over a large part of Bulgaria and Yugoslavia, with a maximum in June and a minimum in January and February; and the "equinoctial" type developed in the western mountains with a spring and autumn excess.

The reputation of South-Eastern Europe for violent summer thunderstorms is justified in the mean monthly frequency tables for that part of the area under the "Continental" régime. Thus Bucharest has 29 days annually with thunder, Belgrade 35, and Sofia 36—figures greatly exceeding those for most places in England, which have about 10, few having as many as 20. There is a marked concentration of thunderstorms in the months of May, June, July, and August, with a maximum in June, when the general rainfall is heaviest, whereas in Central and Western Europe July tends to be the most thundery of the four. In Greece, as in other countries under the "Mediterranean" seasonal régime, there is most thunder in late autumn and winter.

Observations at mountain stations show that in the Rhodope Planina in Bulgaria, where the winter is dry, 45 per cent. of the annual precipitation falls as

snow at 6000 feet as compared with 60 per cent. at that level in the wet Dinaric Alps in Dalmatia. On the other hand, at 2000 feet temperature is the deciding factor, the percentage being 30 in the Rhodopes and 20 in the Dinaric Alps.

AUSTRALIAN SOIL TYPES

In the *Geographical Review* for January 1933 Professor Griffith Taylor reviews the "Soils of Australia in relation to Topography and Climate." He adopts a classification of Australian Soils after Prescott, namely peat, podsol, black earth, chestnut or red-brown earth, grey earth, mallee soils, desert-steppe soils and dunes, following in a series from association with heavy to very low rainfall. A map shows that the soil boundaries in question agree quite well with the annual isohyets or lines of equal rainfall. Thus the "podsol," a term borrowed from the Russians, is only found where the rainfall exceeds 30 inches a year irrespective of seasonal distribution, and the fertile black earths occur with a rainfall between 20 and 30 inches preferably with a summer maximum. The moist outer soil zones lie in narrow belts around a vast oval area in Central and Western Australia of desert-steppe soils, including a large inner tract of dunes, and seem to be determined entirely by climate, having little regard for the three great topographical divisions of the Continent, namely the Western Peneplain, the Eastern Geosyncline, and Eastern Highlands. But when Professor Taylor compares the soil map with a climatic map in which Australia is parcelled out into lettered categories according to the much-used scheme of Köppen he finds no close agreement, still less when he compares United States soils of the same names with the Australian soils in the light of Köppen's nomenclature. He allows that similarly named soils in America and Australia may not be sufficiently alike for application of Köppen's classification, or that the latter is not everywhere applicable to soils. Those who have never approved of artificial attempts to classify the intricacies of climate by any such system of shorthand as that devised by Köppen will not be surprised at the negative result of the comparison.

In connection with the above attention may be drawn to a paper by Mr. E. M. Crowther, of Rothamsted, on "The Relationship of Climate and Geological Factors to the Composition of Soil Clay and the Distribution of Soil Types," which appeared fairly recently in the *Proceedings of the Royal Society* (Ser. B, vol. 107, 1931). The author points out that controversy has always run high on the relative importance of climate and geology in the formation of soils. Thus the Russians, occupying a vast, fairly uniform plain extending through a wide range of latitude, are unduly insistent upon the importance of climate, whereas the British in a small area of fairly uniform climate but highly diversified geology take the opposite view. No doubt in the case of vast territories like Russia and Australia climate appears as the factor which puts in, as it were, the bold strokes of the soil map, since it must determine the availability of the chemical ingredients of the rocks. But in England the problem turns rather on the question how our extremely varied soils would severally react by a new set of weathering processes to any permanent change of climate.

A GRAVITY SURVEY OF NORTH CHINA

At the Stockholm meeting of the Union of Geodesy and Geophysics the Rev. Father Lejay, S.J., described and exhibited a new type of gravity pendulum which had been elaborated in Paris by himself and M. Holweck. The pendulum is inverted: a quartz bob held erect on a springy strip of elinvar. If the bob is too heavy it will on the slightest displacement from the vertical bend the spring down beyond recovery; but if the mass of the bob is nicely proportioned to the elasticity of the spring the inverted pendulum will perform slow oscillations, whose period is very sensitive to variations in the gravity acceleration. Since

the spring is elinvar the temperature coefficient is small and well determined; and a secular change in the elasticity of the metal is not large enough to be troublesome. Experience has shown that it is a mistake to make the period too great. A pendulum a few inches long, contained in an exhausted tube like an early radio valve, may have a period of about 6^s and be so sensitive to changes of gravity that the change of period is large and no great refinement is required in the measure of time. Thus a pendulum which at Paris oscillated in 6^s·35 in Singapore took only 5^s·18, and the time of 100 swings, about 10^m, observed with a good stop-watch, will give a value of g from the simple equation:

$$g = 986{\cdot}624 - k/t^2$$

where k is a constant depending on the elasticity of the spring and t is the time of an oscillation. The whole time of an observation is "quinze minutes, calculs compris," as Father Lejay said at Stockholm.

At the Lisbon meeting of the Geodetic Association M. Holweck gave the first results of the gravity survey of Northern China, made in May–July 1933 by Father Lejay and Mr. Lo Jo Yu under the auspices of the National Academy of Peiping, now published by the Institute of Physics in that Academy. In those three months the pendulum was taken 1500 km. by sea, 3000 km. by train, and 2000 km. by road and by track, and control observations at Zikawei on its return proved that it has stood up well to the hardships of the journey. A preliminary reduction shows that the Bouguer anomalies are small on the coast and decrease steadily westward to about −150 milligals in Shansi. The curves of equal anomaly are roughly north and south, and there are evidently large systematic defects of underlying density in the West. Thirty-two stations were occupied, and about twenty swings made at each station.

This excellent contribution to gravity survey bears great promise for the future. The apparatus is so light that it can be carried in a single knapsack, and economy in transport must be reckoned against the high initial cost. An energetic man with a small car might do wonderful work in Africa with this instrument, whose inventor and constructor are much to be congratulated on the first considerable fruits of their enterprise.

GLACIAL ROCK FORMS

The latest addition (No. 218) to the series of supplements to *Petermanns Mitteilungen* is by Professor O. Flückiger, and deals with certain glacial rock-forms. Setting aside morphological features and glacial deposits, the author examines rock types produced by the advance of glaciers over their surface, those found at the exits of hanging valleys, and those known as cirques. Though most of his material is drawn from the Alps, he also uses examples from Scandinavia, Labrador and other more recently glaciated areas. The task of studying the work of ice has been complicated in the Alps by the changes later wrought by fluviatile erosion; but by comparing the resulting forms with those in Scandinavia and elsewhere, he is able to disentangle the two processes, to determine features of the true glacial landscape, and so to assess more accurately the work of the ice. He concludes that it is impossible to deny to it a considerable influence in the fashioning of surface features. The monograph is illustrated by a number of clear and apposite photographs.

COATS OF ARMS ON THE PORTOLAN CHARTS

A constant feature in the early Portolan Charts, which adds not a little to their decorative appearance, is the representation of coats of arms in association with many of the principal cities. We believe that no serious attempt to study these has so far been made, for the general idea has apparently been that they were put in more or less at random, and that no trust could be placed on the exactness of

the attribution of arms. This view is contested in a recent paper by Sig. Giuseppe Gerola, published in the *Atti* of the Reale Istituto Veneto, vol. 93, 1933–34, Parte Seconda, which is worth the attention of those interested in early cartography as well as in heraldry. He has made a careful study of the coats, fifty-nine in all, shown in the Dalorto (or Dall' Orto) portolan chart, which has a special interest for this Society as the first item in its series of reproductions of early MS. maps in course of publication. Before dealing with these in detail, he discusses briefly the general subject, pointing out that these charts supply almost the only material for a knowledge of early heraldry as concerned with the insignia of cities as opposed to private families; for he holds that the 'Libro del Conoscimiento,' often quoted in this connection, probably depended on these very charts for the knowledge of the subject that it shows. While the heraldic details may occasionally throw light on historical events, they are also important in connection with cartographical history, provided they are used with caution. An instance of their use for dating purposes is the insertion of a Portuguese flag at Ceuta in the anonymous Florence Portolan chart, usually placed either at the end of the fourteenth or the beginning of the fifteenth century. As Ceuta was not conquered by the Portuguese till 1415, the chart cannot anyhow be earlier than this year. Something may be learnt too as to the nationality of the chart makers. Thus it is found that the heraldic detail in the Dalorto map (the doubtful date of which the writer reads as 1330, not 1325) is particularly full and accurate for Italy, while very scanty for Spain, and confirmation of the Ligurian (rather than Majorcan) origin of the maker is found in this fact. The writer has had the advantage of studying this chart in the original, for though he cordially recognizes the value of the coloured reproductions of this Society, even these do not permit all the details of the arms to be grasped. With uncoloured copies the proper study of the arms is impossible. It may be noted that the arms are shown in varying ways, both as shields and as banners—in the latter case usually with a staff either to right or left, which helps to localize the arms more precisely. It is for the more distant countries, in North Africa or Western Asia, that the most interesting results may be expected, and Sig. Gerola hazards the suggestion that even if some of the coats assigned may be due to the fancy of the draughtsman, their use in these charts may actually have led to their eventual adoption. In the latter part of the article he gives a careful description of each coat, and though he does not claim the essay as more than tentative, it certainly shows that the subject deserves to be pursued further by those competent to do so.

A NEW MAGAZINE OF TRAVEL

We have received from the Cambridge University Wayfarers' Club the first number of their publication *The Wayfarer*, which is to appear at irregular intervals at half a crown a number. It is attractively produced, well illustrated, and contains a good deal of entertaining reading, described in the preface as "a collection of experiences, undertaken by quite ordinary people"; a modest understatement. The writers spent no large sums of money on their travels, were under twenty-five years of age, and relied mainly upon luck and perseverance. They have related their experiences lucidly and the more tellingly since most have refrained from "writing them up." The best is perhaps the account of a voyage on a four-masted bark from Queenstown to Australia and back. It brings out very clearly the varying conditions of life on a sailing ship in the several windbelts. Other writers describe various cheap and out-of-the-way holidays—a nine weeks' trip to Spitsbergen for £17, or a few months in Labrador with the Grenfell Mission for £40, and so on. *The Wayfarer* should succeed in fulfilling its aim—"to tempt one reader to leave his familiar haunts."

OBITUARY

H.R.H. PRINCE SIXTE OF BOURBON-PARMA

Prince Sixte of Bourbon-Parma, whose death at the early age of forty-six we record with deep regret, sprang into prominence during the War in connection with the unsuccessful peace negotiations between the Allied Powers and Austria-Hungary in 1917. At the close of the War, during which he had served with distinction in the Belgian Army, he devoted himself to historical and geographical research. For his travels in Northern Africa he was awarded a gold medal by the Geographical Society of Paris. It will be remembered that in December 1932 Prince Sixte read a paper to the Society on the routes across the Sahara, and their part in the development of the French African Empire.

MEETINGS: SESSION 1933–34

Sixth Afternoon Meeting, 9 April 1934. The President in the Chair

Paper: The East African Arc of Meridian. By Major M. Hotine, R.E.

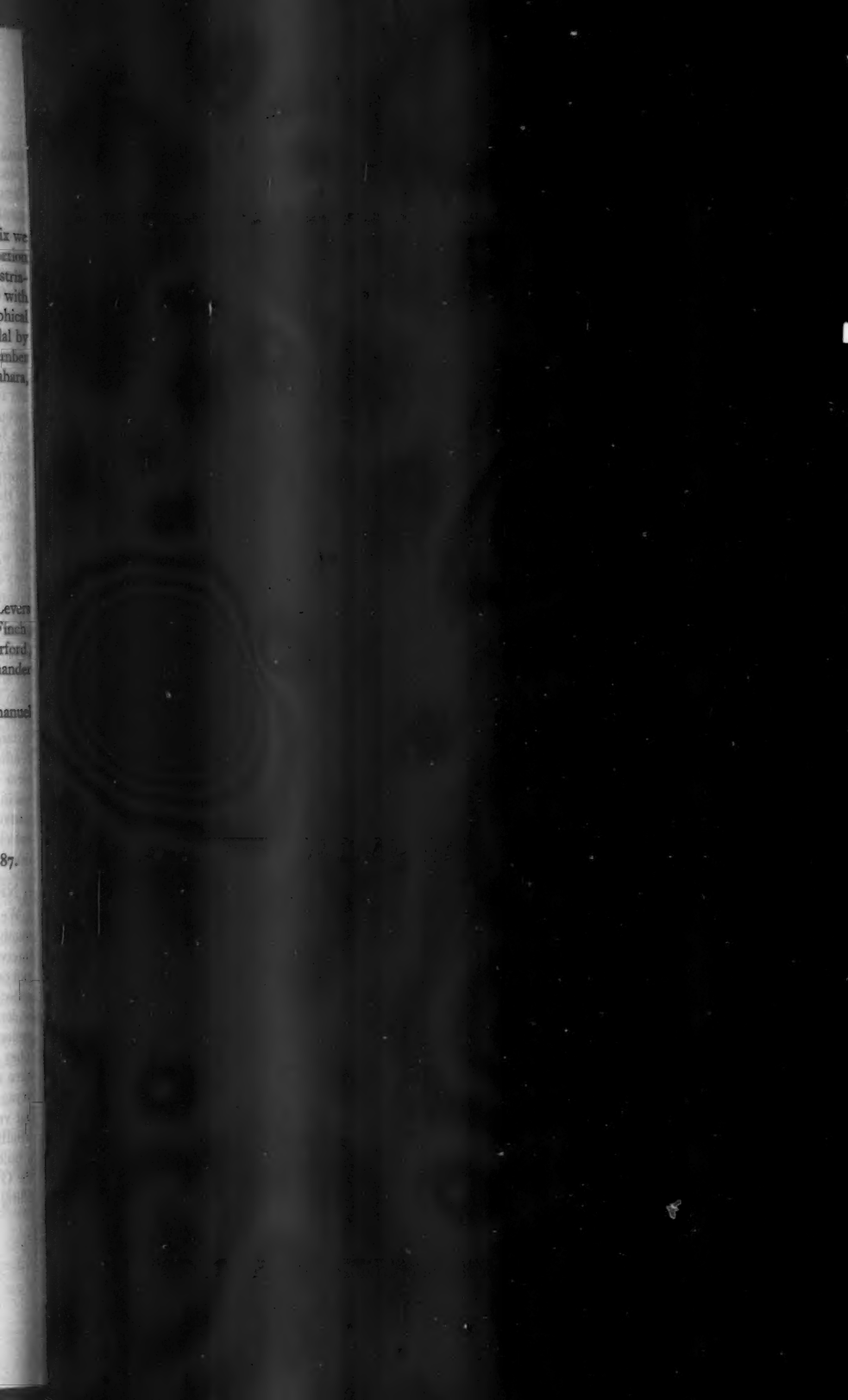
Eleventh Evening Meeting, 16 April 1934. The President in the Chair

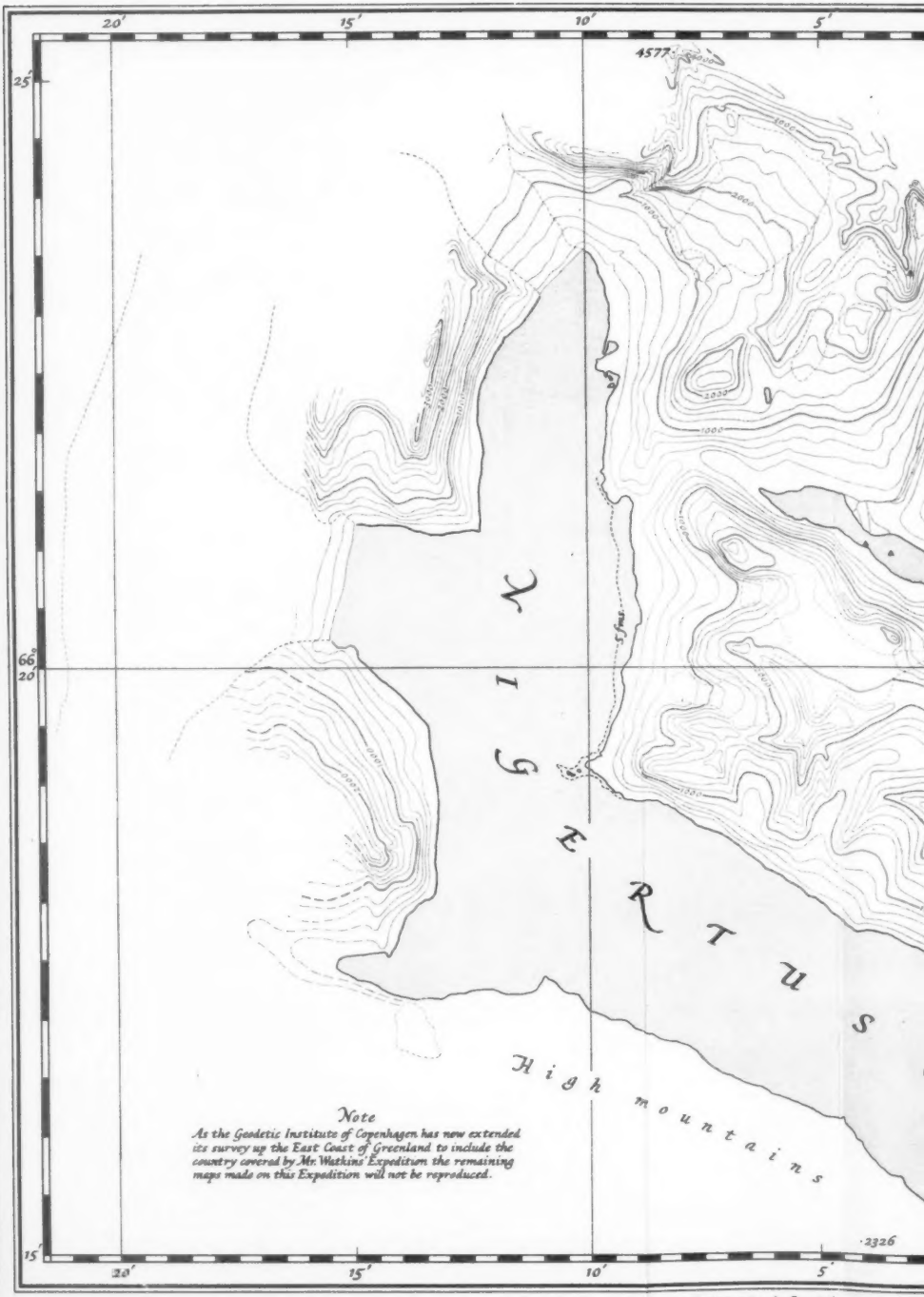
Elections: Benjamin Angwin; John Chugg; Rev. Richard Edward Levers Collins; Henry Croudace; Miss Janet Alderson Crisp; Frank George Finch; George T. Mills; Mrs. Stewart Morse; S. Muthukrishnan; Adam Rutherford; The Rt. Hon. Lord Tweedmouth, C.M.G., M.V.O., D.S.O.; Lieut.-Commander Thomas Wontner Smith, R.N.V.R.

Paper: The Andes of the North-west Argentine. By Professor Emmanuel de Martonne

ERRATA: February *Journal*

Plate facing page 132: for '*Fort of Minab*' read '*Fort of Bam.*'
Page 145: In table, Longitude 120° Latitude 45° B, for 8·37 read 8·87.

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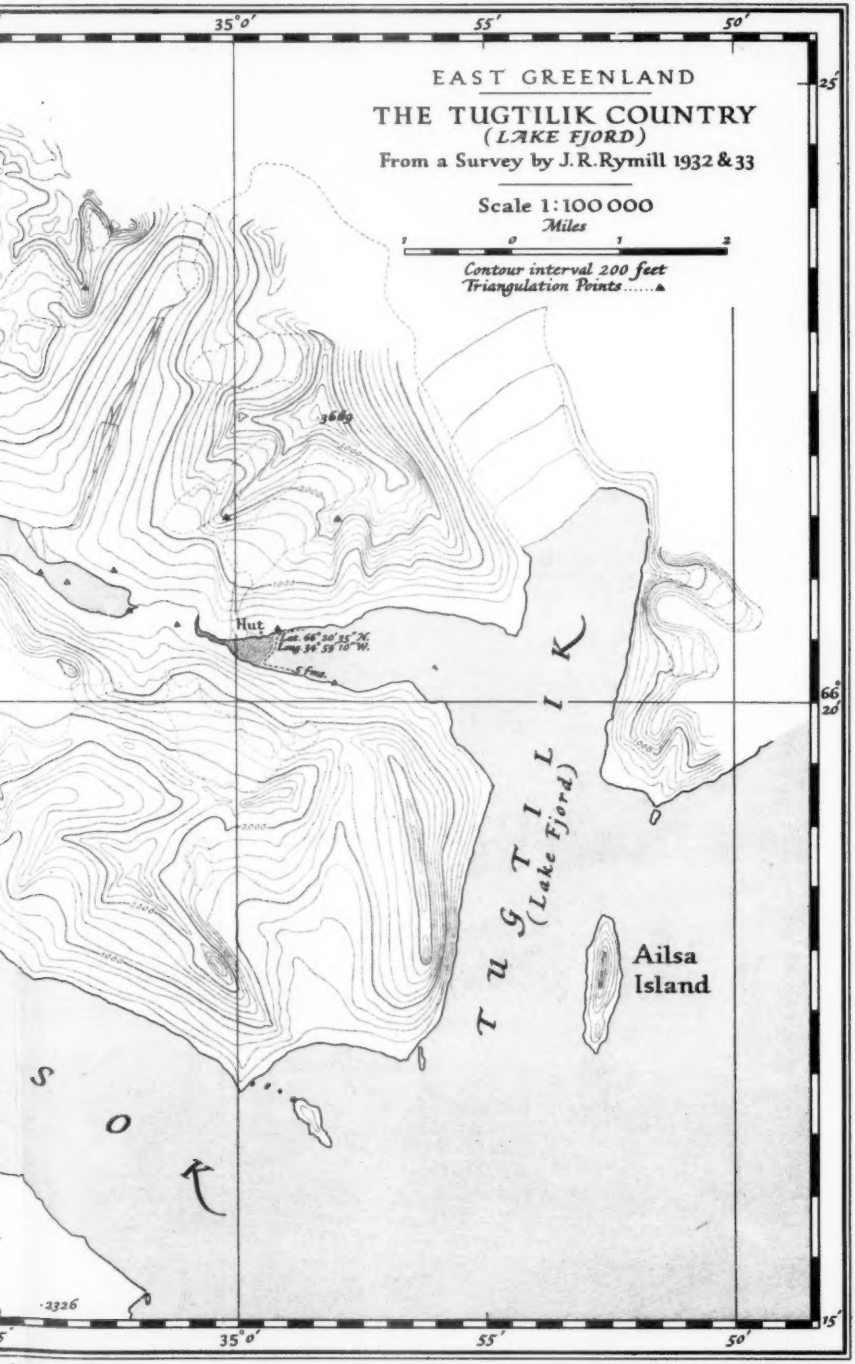
Note
As the Geodetic Institute of Copenhagen has now extended its survey up the East Coast of Greenland to include the country covered by Mr. Watkins' Expedition the remaining maps made on this Expedition will not be reproduced.
High mountains

Published by the Royal Geographical Socie



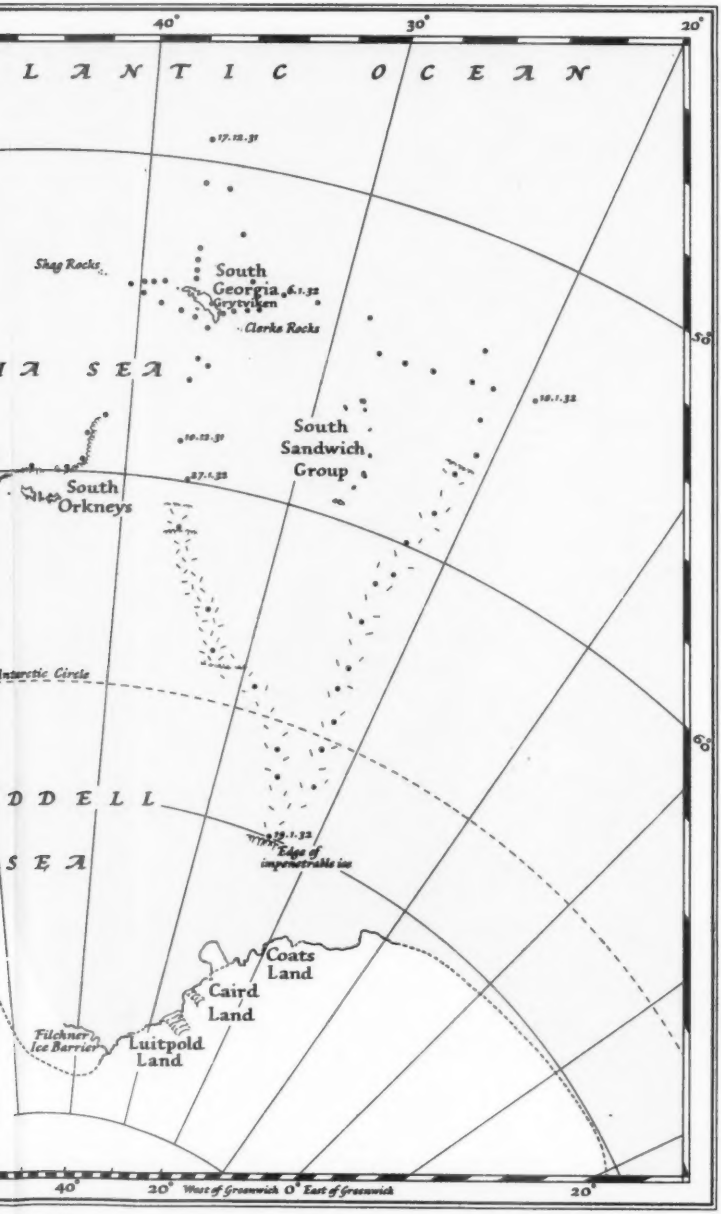
Geographical Society

EAST GREENLAND
Rymill

Stations of the Falkland
Season 1931

Map 1

Falkland Islands Sector
son 1931-32

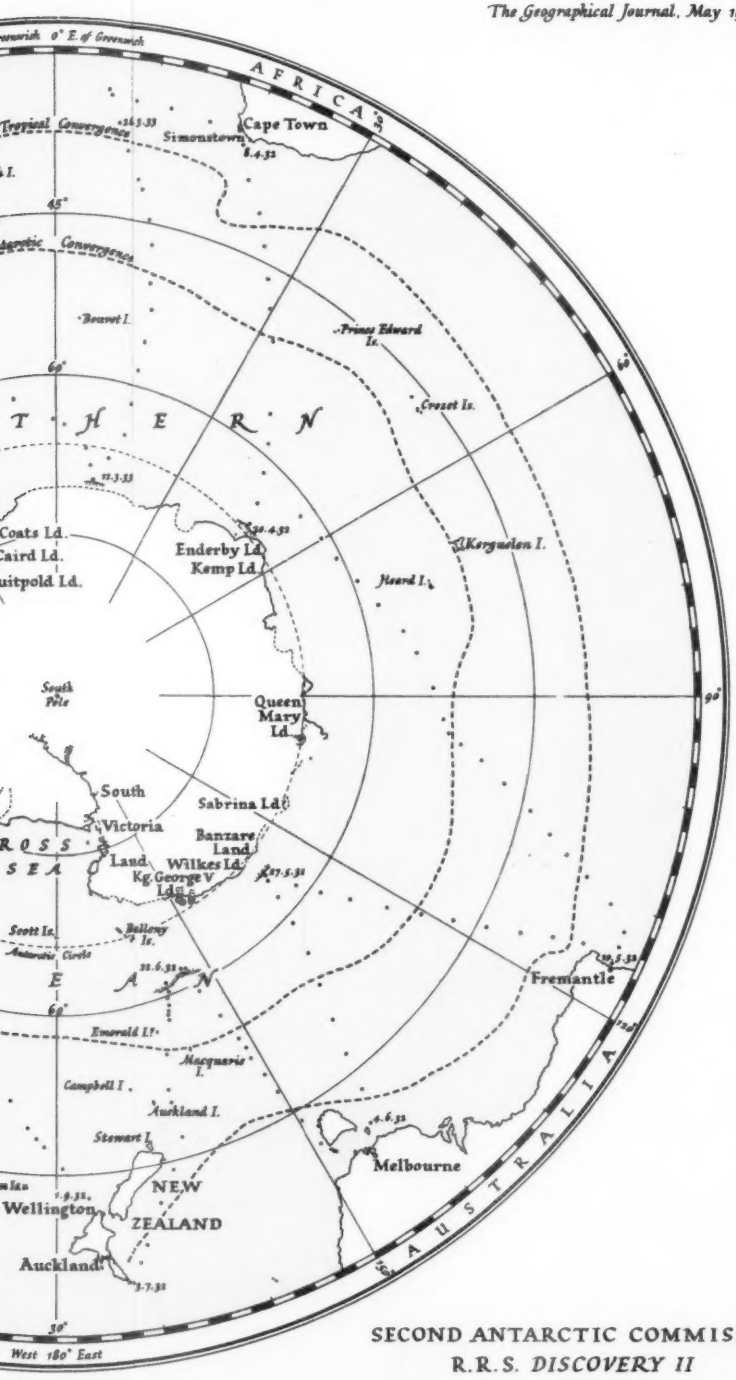


Map 1

Stations of the Circumpolar Cruises
Winter 1932, and of the
Falkland Islands Sector
Season 1932-33

ublished by the Royal Geographical Society

Map 2



SECOND ANTARCTIC COMMISSION
R.R.S. *DISCOVERY II*

Map 2

John